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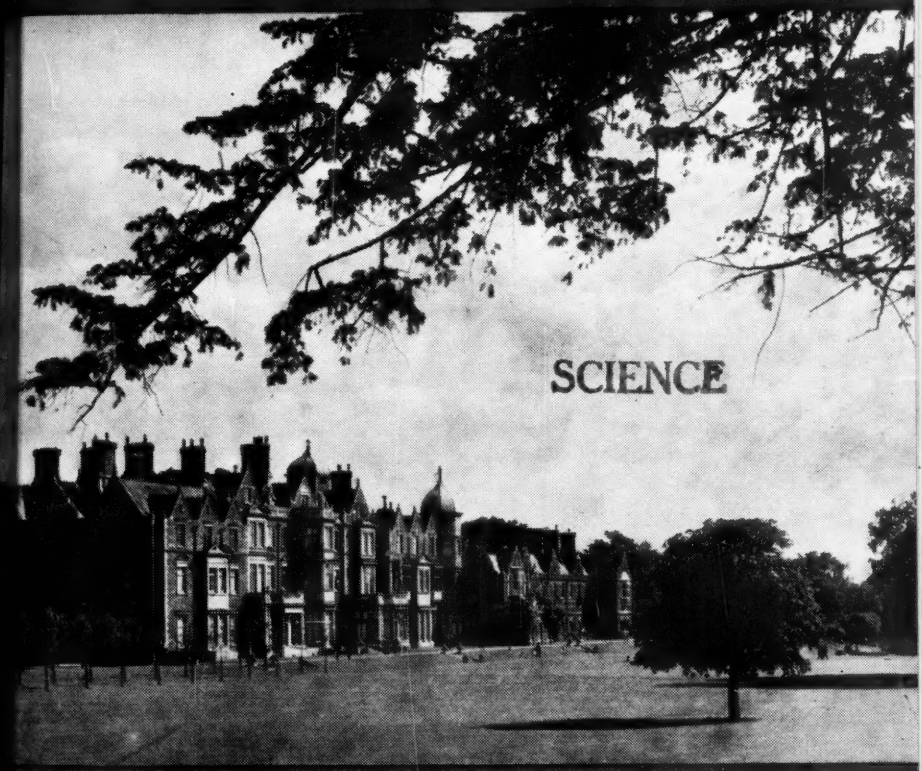

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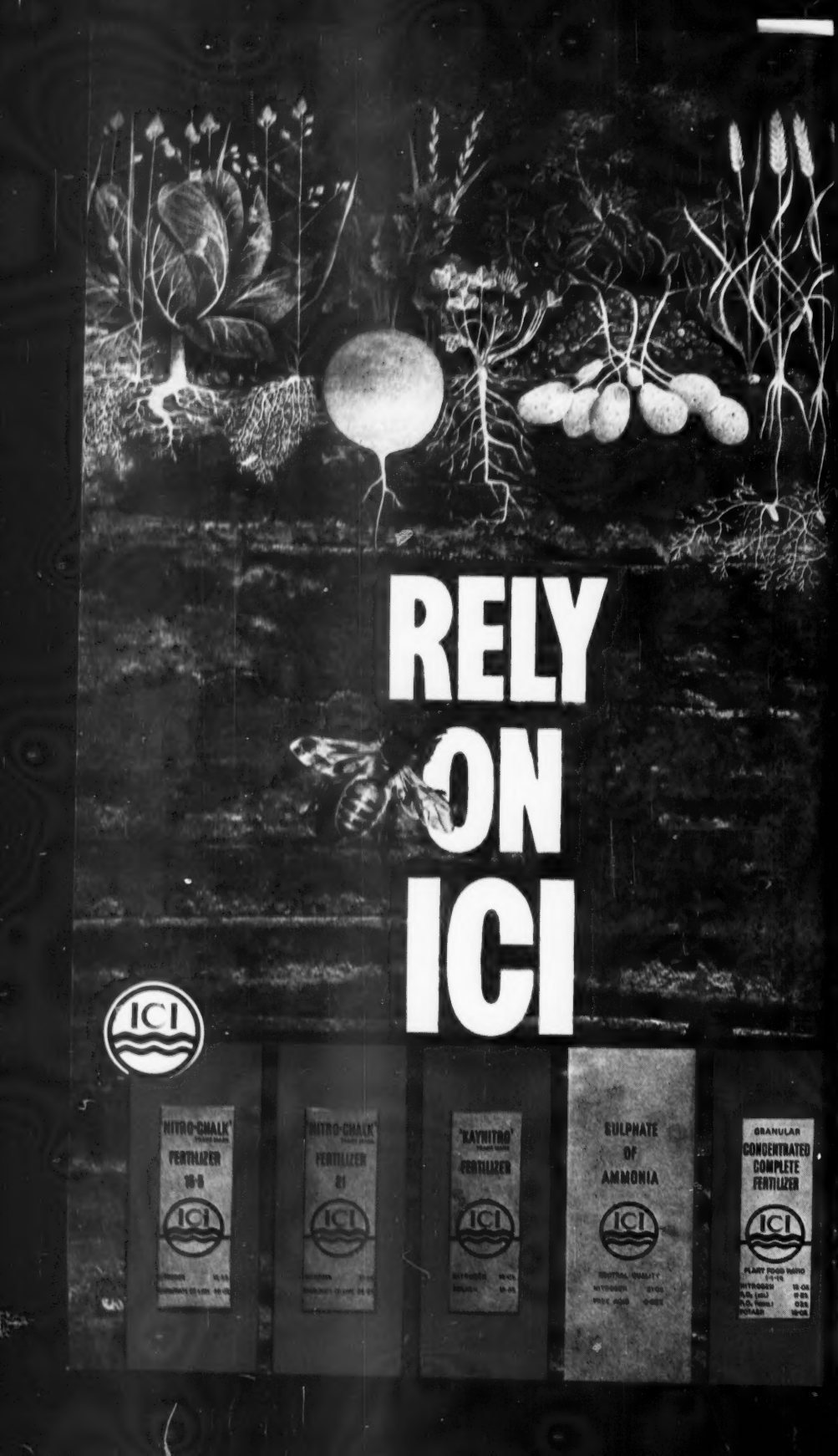
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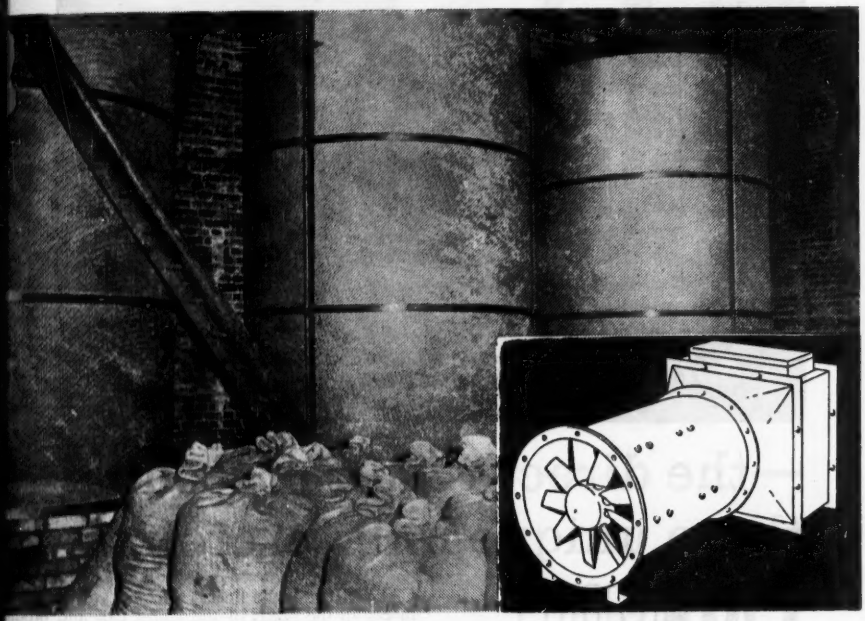

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CONTENTS

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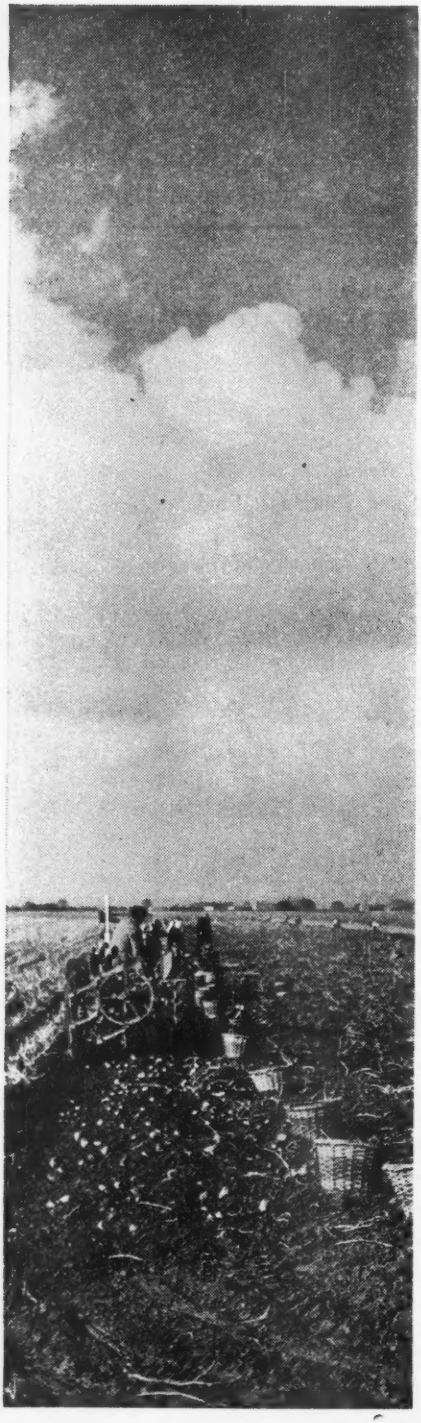

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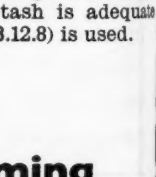

Lambs when Desired

ALLAN FRASER, M.D., D.Sc.

Dr. Fraser describes three ways of spreading the lambing season throughout the year.

THE general pattern of sexual activity seems to be similar in all breeds of sheep. Such activity is at its maximum in autumn, minimal in spring. The controlling influence of day length, acting upon the trigger of the anterior pituitary and its level of gonadotrophic hormones, is now too well recognized to deserve further description. The matter, as it affects sheep husbandry practice, is that *all* breeds of sheep display their greatest sexual activity in autumn, and that in most British breeds such activity is *confined* to autumn. The Dorset Horn is the only British breed—considered as a breed—that can be counted upon to escape that confinement.

Let it be admitted at once that a limitation of breeding to one season of the year is a definite handicap in the raw material of any system of animal husbandry aiming at intensive production. It is, moreover, an equal handicap in any system of agricultural economics directed towards organized marketing. From the production standpoint it means, in sheep husbandry, that no more than one crop of lambs can be looked for in one year. From the marketing angle it implies that the bulk of the seasonal lamb crop comes on to the market all at one time.

It would therefore simplify both husbandry and economics if *all* our British breeds of sheep, like the Dorset Horn, were capable of conceiving lambs at any season of the year, and that, moreover, whether or not they were suckling lambs. It would be, unquestionably, a valuable potential in any breed of sheep, whether that potential were permitted expression or not. Perhaps, as our sheep husbandry is organized today, in most cases it would not. For, so long as the development of our animal husbandry systems is geared to the growing of grass, the peak of animal production should, wherever possible, be synchronized with the peak period of the growth of grass. Consequently, whatever the potentialities of a sheep breed might be, so long as grass remained the pivotal crop of sheep husbandry, it would be necessary to mate the majority of ewes in autumn so that they might lamb in spring.

Nevertheless, the capacity for all-the-year-round mating would give a welcome degree of greater flexibility to all sheep husbandry systems. It would make double lamb cropping possible were such intensification of production deemed economically desirable, and it could be used to spread the supply of unfrozen lamb to the meat market more equally throughout the year. Like reserve ammunition, the latent capacity might never be used, but it would never be superfluous.

Potential of the Dorset Horn

How, then, could the potential of continuous breeding be spread throughout our flocks? To me, there seem at least three methods worthy of serious consideration.

The first is a rapid multiplication of the Dorset Horn breed, a suggestion likely to meet with the unqualified approval of at least one breed society! The suggestion is not quite so unpractical as it may sound. The breed has already increased substantially in both numbers and distribution in tune with a growing interest in out-of-season lamb production. Like all other sheep breeds it is infinitely more adaptable than is commonly supposed, so much of the inertia of environment being somewhat uncritically attributed to the activity of genes! I can recall my surprise on being informed by a South American sheep expert from Chile—(or was it Peru?)—that the most successful breed of *hill* sheep in his country was the Suffolk Down. So also with the Dorset Horn. It is a breed that can become adapted quite successfully to many forms of sheep husbandry widely different from the folding system of its native county.

Even in Aberdeenshire, in a climate where men talk of heat-waves when it is barely warm enough to watch cricket in comfort, the Dorset Horn thrives perfectly well. Some years ago we established a small flock on the University Farm purely for experimental purposes connected with a study of milk yield in ewes. Although the experiments have been discontinued, the sheep are still there, doing rather better than when they first came and retained because of their commercial utility. After all, the natural ability of the Dorset Horn to mate and lamb at any season is somewhat of a providential gift and it would be a mistake, perhaps, to look a gift sheep in the horns, particularly as a polled variety, developed in Australia and since re-imported, is now available here at home.

A too rapid expansion of a breed has, however, certain inherent disadvantages in any type of farm animal. Because of reduced rate of culling, it results, inevitably, in a certain loss of uniformity and sometimes, more seriously, in a distinct deterioration in productive capacity. Again, it must also lead to an increased price for breeding stock, particularly female breeding stock, which in turn may make purchase uneconomic, however desirable.

Developing other breeds

There have, in consequence, been suggestions made for developing other breeds to match the Dorset Horn; and that seems to me to be the second method deserving serious consideration. Individual ewes in many other breeds show out-of-season mating behaviour. Such ewes, at least according to the books, are quite commonly met with among Hampshire and Dorset Downs and, on the authority of Sir John Hammond, in the Derbyshire Gritstone as well. We get ewes of this type among our Scottish breeds also. In Blackface stocks I have seen the odd lamb born out of all due season, proving that mating had been successfully solemnized five months earlier without the shepherd's consent. Half-bred ewes have been known to suckle two successive crops of lambs in the course of one year, showing that lactation anoestrus had been successfully broken. I am sure that if rams were given free access to the ewes throughout the entire year, these exceptional cases would be much more common than is generally supposed.

Would long-continued selective breeding from these ewes of exceptional breeding behaviour result in strains say of Blackfaces and Half-breds which, like the Dorset Horn, would lamb as desired at any season of the year? I do

not know. These exceptional ewes are those, presumably, with exceptionally active anterior pituitary glands, consequently having an exceptionally high level of gonadotrophic hormones in their circulation. Whether this activity is sufficiently strongly heritable to make selection effective I again do not know. I am certain that attempts at such selection, commencing presumably with the running of vasectomized and raddled rams with the ewes for at least a twelvemonth, would be both slow and expensive. It might seem simpler, more direct, and a great deal quicker, to raise the gonadotrophic content of any ewe's blood by hormone injection to a level sufficiently high to overcome seasonal and lactational anoestrus. That, of course, is what Dr. Ian Gordon attempted to do in his series of field experiments. He had, undoubtedly, some notable successes together with some unexplained failures. To me the successes seemed more important than the failures, and I could have wished to have seen this daring application of endocrinology carried to its final conclusion.

Crossing the Dorset Horn

Thirdly, we have the other breeds of sheep *and* the Dorset Horn. In such crossing, as is very well known, a great deal of the Dorset Horn's out-of-season mating behaviour is displayed by the crosses. Such a system, using the North Country Cheviot ewe to cross with the Dorset Horn ram, is by no means novel. It was being tried out by a well-known Ross-shire flockmaster of his time, William Gunn, at my birth-place, Strathpeffer, more than half a century ago. It has been tried out since and is, in my opinion, a trial worth pursuing.

It does not—using the Cheviot as an example—necessarily involve the evolution of a new out-of-season lambing Cheviot breed, although theoretically that should be possible by repeated back-crossing to Cheviot, discarding all but out-of-season breeding ewes. It might be done more swiftly and simply by a system of criss-cross breeding—again taking the Cheviot merely as an example—using the Dorset Horn ram to pull the Cheviot in the Dorset Horn direction; then reversing the trend by the use of Cheviot rams over one or more seasons.

I have seen a somewhat similar system of criss-cross breeding between the Cheviot and Welsh Mountain, as developed by the McTurks and others, in the hill districts of Wales. Judging from the appearance and the productivity of the sheep flocks of this type I have visited in Brecon and elsewhere, the system seems to me to be a good one. Some might consider these flocks as being neither Scottish nor Welsh, neither flesh, nor fowl nor good red herring, but there seems to be no difficulty in their sale or disposal. If ewes thrive and rear good saleable lambs, in fact do the job well for which they are kept, why worry too much about the purity or otherwise of their breeding?

Possibly, in such a system of criss-cross breeding that shy stranger called Hybrid Vigour is somewhere involved. I don't quite know what hybrid vigour really implies. I have even heard geneticists confess that they are not altogether certain, which is a rather remarkable confession to be made by a geneticist. Is it altogether too heretical to suggest that it may amount to little more than a restoration of the pristine vitality of the aboriginal and unselected sheep, before Bakewell was canonized and in-breeding began?

Avoiding Losses in Calf Rearing

WALTER R. SMITH, B.Sc., N.D.A.

*Deputy Director, N.A.A.S., Yorks and Lancs Region**

The principles of good calf rearing are straightforward and not hard to apply. Calves should be made comfortable and given colostrum and a high quality diet early in life, and bacterial activity in the rumen should be encouraged.

DOWN through the years good calf rearers have known and practised husbandry methods which have been eminently successful. They have not always known the scientific reasons why, but modern research on the physiology of the young calf has shown that what they practised was scientifically sound. Progress, therefore, in the technique and art of calf rearing must come from the retention of proved husbandry methods combined with the application of knowledge which science has provided. This article is intended to pin-point those factors which are important in successful calf rearing and the reasons for them.

The benefits of colostrum are well known to the calf rearer. When the calf is born on his own farm, or purchased privately direct from the breeder, the rearer can usually make certain that colostrum is fed. It is not so certain, however, that the calf bought in the open market at the age of two or three days has had colostrum. Moreover, it is subjected to the rigours of the cattle market and often the stress of a long journey before it reaches its new home. Small wonder that some of these calves succumb to disease!

The calf depends on antibodies present in colostrum to give it resistance to some diseases. These antibodies are only passed into the blood during the first two days of life; hence the need for colostrum at this time. In addition it contains easily digested proteins and abundant supplies of vitamins A, D and E. In these days, when deep-freeze cabinets are installed in many farmhouses, a supply of colostrum can be stored for use when the fresh liquid is not available. Veterinary research has shown that certain antibiotics are a safeguard and a benefit to calves deprived of colostrum, and veterinary surgeons can advise on this point.

The newly-born calf, and particularly the bought-in calf, needs "a good warm through" and a drink. The former will be given colostrum from its dam, but the latter needs special treatment. Many calf rearers have equipped reception pens with infra-red lamps, an easy and effective method of providing warmth. The drink for the bought-in calf should only be glucose and water, about three pints at the first feed, and no milk at all. Half a feed of milk or less can be given the next day, working up to full feed over a period of about three days. Many calves are killed by kindness in giving heavy feeds of milk to travel-weary animals.

Comfort

Calves are subject to a number of disorders. It is my own experience and that of many good calf rearers that comfortable conditions in the calf pen,

*When this article was written, Mr. Smith was Livestock Husbandry Officer at Aberystwyth.

coupled with the right diet and art in feeding, can prevent many of the common disorders. The need for comfort for the calf during the early weeks of its life cannot be overstressed. A dry bed, solid partitions to the pens to cut down draughts, and a reasonably warm house are the basic necessities. Without some modification, many of our modern high concrete buildings, with wide doors at each end and open rail divisions, are quite unsuitable for rearing young calves. Much can be done to improve them by fitting overhead canopies to the pens and insulating them with straw to conserve warmth, and by adding a good depth of litter to provide a dry bed. Calf rearers of former years appreciated the calf's basic need of comfort and it is essential that this is remembered when new buildings are designed.

Nutritional scour

About one-third of the total calf mortality is due to a disorder now termed nutritional scour to distinguish it from the well-known white scour of bacterial origin.

Nutritional scour is due to indigestion in the first part of the alimentary tract. The undigested food passes into the bowel where the bacteria present work on the fermented food, breaking it down into small particles, and the watery mess is expelled as a scour.

Proper feeding and close observation can prevent nutritional scour. At the first sign of lassitude, lack of interest in food and certainly at the first symptoms of scouring, food should be withheld. Instead, warm water should be given. In the majority of cases, starving the calf for about a day gives sufficient time for the overworked digestive system to cope with the food already in the alimentary tract, and the calf begins to recover. The normal feed can then be gradually reintroduced. In more severe cases it will take a little more time.

As stated, where whole milk feeding is practised, the disorder of nutritional scour is more often due to overfeeding than any other cause. It is a common fault in calf rearing to overfeed in the early stages and underfeed later. In systems where milk substitutes are fed, nutritional scour is the result of overfeeding or the use of poor quality substitutes in a liquid form. Research work has shown that of the carbohydrates only lactose (milk sugar) and glucose can be digested by the young calf when fed in a liquid diet. It is the bacterial action in the rumen, once it begins to function, that gives the calf the ability to digest other forms of carbohydrate. This shows the importance of milk substitutes containing a high proportion of dried skim milk as a source of lactose, and also the need to stimulate, as early as possible, bacterial activity in the rumen. Formerly this was done by offering hay of the best quality, although at that time no one knew much about physiology in the rumen! Nowadays hay is still offered, but concentrates are introduced at a week old as well.

The majority of artificially reared calves are fed whole milk for periods of one to six or eight weeks. Thereafter many are fed on proprietary milk substitutes, fed as liquid or in the dry form. These substitutes are excellent in quality and palatability but are designed for feeding at specific stages in rearing. It should be remembered that the more economy there is in milk feeding, the greater the need for a high quality substitute.

White scour

White scour is known to all calf rearers. It is caused by a particular strain of *Bacterium coli*. Protection against the disease is given by the antibodies present in colostrum, but any stress, like a day in a cold cattle market or in miserable housing conditions, predisposes the calf to the disease. It may also be secondary to nutritional scour when the disease-producing organism has the opportunity to multiply and cause white scour. Hygiene and a change or rest for the house from calf rearing will help to reduce the incidence of white scour. Veterinary advice and treatment are necessary once the disease exists as modern drugs can sometimes assist in a cure.

Improvement of Permanent Pasture in East and South-east England

G. PEARSON HUGHES, B.Sc.
and
W. GARETH GWYNNE, B.Sc.
National Agricultural Advisory Service

With the intensity of arable farming in the east and south-east of England, the remaining grassland must be used to best advantage. Methods of improvement of certain permanent pastures under these conditions are suggested.

OFFICIAL returns for England and Wales in 1960 show a total of some 10½ million acres of permanent pasture as well as 5 million acres of rough grazings. Much of this permanent pasture is in the west and north of the country where, owing to higher rainfall or elevation, pastoral conditions prevail. In the south-east and east, where arable farming is predominant, permanent pastures are generally confined to areas which on account of their situation or soil type are difficult to handle under an arable cropping rotation. We shall concern ourselves here with the improvement of these areas.

Large acreages are to be found in permanent pasture in the flood plains of rivers and streams. In the past, many of these pastures have not been properly maintained in good productive condition, but more farmers are now making some attempt at least to raise the quality of their grazing and hence their output of livestock products.

The quality of these pastures varies. Most have deteriorated badly, even to the condition where they are made up of rushes (*Juncus* spp.) and tussock grass (*Deschampsia caespitosa*), common reed (*Phragmites communis*), sedges (*Carex* spp.), iris or flag (*Iris pseudacorus*), meadowsweet (*Filipendula ulmaria*), sweet grasses (*Glyceria* spp.) and the like. The soils in many cases are of an alkaline peaty nature, rich in organic matter and lime, puffy, and difficult to consolidate when once disturbed. These soils are low in phosphate content, with a medium potash condition, and may also lack certain trace

elements, particularly manganese and copper. In the course of improving fertility levels both phosphates and potash are desirable, while herbage growth may indicate the need to apply small quantities of such trace elements either as part of the general fertilizer dressing or as a foliar spray.

Importance of the water level

The degree of improvement possible depends very largely on the general water levels throughout the year. Where the level is high for most of the year and it is difficult to get the water away, the only practical means of improvement is to ensure that the coarser herbage is not allowed to become completely dominant, so making the grazing completely useless even in the drier periods of the year. To prevent this the area should be mown with a horizontal rotary cutter, leaving the cut material spread over the sward. Such treatment will prevent the dominance of the coarser herbage, encourage the better grasses such as creeping bent (*Agrostis stolonifera*), and allow better conditions for the animal to graze on the more palatable recovery growth.

The water level may, however, be lower in many areas, and may permit more extreme measures of improvement, involving the destruction of the existing vegetation and its replacement with sown seeds mixtures. The main difficulty encountered when such improvement is contemplated is that of carrying out the necessary cultivations; any machinery used may become bogged down. In addition, once this type of soil has been moved reconsolidation may be extremely difficult, and it may not be possible to provide the firm seedbed so essential to the proper establishment of small seeds. Both these difficulties may be largely overcome by using a rotary cultivator to prepare the seedbed rather than by ploughing. In the first instance the rotary cultivator helps in moving its power unit forward by the action of the rotor blades themselves. Secondly soil cultivation can be kept as shallow as possible, consistent with the production of just sufficient tilth to bury the small seeds sown while not destroying the underlying consolidated soil—as would happen with ploughing.

Where the original vegetation has grown wild and neglected for some time it should be destroyed before attempting this rotary cultivation. If burning is not possible, rotary cutting again is the cheapest method of clearance. If the original vegetation consists of a grass sward of low production capacity rather than overgrown vegetation, it may be more desirable to destroy it by chemical means, using a grass destroyer such as dalapon. Where only the rotary cultivator is to be used to prepare the required seedbed, three or four cultivations will be necessary. These can be carried out between late autumn and early spring. Where it would not be feasible to have the land bare during winter because soil would be lost in times of flood, destruction of the sward by chemicals in the autumn, allowing the dead herbage to protect the soil from erosion over winter, followed by spring rotary cultivation, may be preferable. In some situations rotary cultivation in the spring may suffice to produce the necessary seedbed.

Completely fresh start unnecessary

Complete destruction of the old vegetation is not possible or necessary. The aim should rather be to obtain a considerable improvement, while

recognizing that some of the original vegetation will inevitably regenerate. To ensure, however, that in the course of time almost complete improvement takes place, it is better initially to seed the area down to a vigorous "pioneer" crop such as Italian ryegrass, preferably S.22. This will itself compete with the regenerating vegetation and will allow the area to be grazed soon after sowing. Seeding should be generous; in the region of 30-40 lb per acre. Such a seeding, intensively managed under a cutting or grazing régime, will last for two to three years. At the end of this period of preparation the land can again be rotary cultivated and sown to a similar or longer ley. In the case of the latter, the seed mixture should be based on a leafy, persistent type of perennial ryegrass such as S.23. This can make a dense sward, so reducing weed ingress and at the same time having the capacity to stand up to concentrated grazing. Mixtures based on meadow fescue/timothy can also do well under these conditions if properly established, but as a rule they do not persist as well as those based on perennial ryegrass. They have not the same competitive ability for keeping out regenerating grasses and weeds. Also, perennial ryegrass when grazed down properly before winter can withstand a degree of flooding. On the alkaline, peaty soils, white clover is often slow to establish, and under these conditions black medick (*Medicago lupulina*) has been found useful.

Pioneer cropping

In addition to the river meadows that can be improved by these methods, there are in East Anglia considerable areas of Washlands in permanent pasture, which in times of flood are used for keeping the flood waters within bounds. Grass swards are usually already present and here, particularly where the herbage is contaminated by coarse tussock grass, killing the turf by chemical means is probably advisable before rotary cultivation takes place. Furthermore, under these particular conditions it is probably better to sow the area to a long ley immediately rather than to go through a process of pioneer cropping with Italian ryegrass before seeding down permanently.

The vigour of the new seeding based on Italian or perennial ryegrass will itself serve to check a good deal of weed growth. But it will not prevent weed infestation completely, and it may be necessary to keep broad-leaved weeds under control by suitable spraying techniques later on.

In the New Forest

Another area of permanent pasture in the south-east of England is found in the New Forest. Here a large area of land has been improved, both in the Forest itself and on farms on a similar soil. Such soils are characterized by being mainly gravelly, with a shallow cover of peat, extremely acid, and carrying a heath vegetation in their natural state.

Cultivations preparatory to seeding down have been based on the rotary cultivator, as here again it is essential that only the top layers of the soil be cultivated. In this way the small amount of organic matter present is conserved at the surface, and lime can also be incorporated in the topsoil. This lime is usually applied in the autumn and followed by one or two rotary cultivations. The land should then be allowed to settle, further rotary cultivations being done in the spring if need be, with a further dressing of

lime immediately before sowing. In the past a complete fertilizer dressing has also been given at sowing time but evidence is accumulating that only phosphate is necessary at this time, potash preferably being applied later. Application of nitrogen at seeding time seems to be unnecessary.

In the actual Forest grazings a seeds mixture based on S.23 perennial ryegrass and white clover has been used exclusively, as the improved areas are extremely heavily stocked and such a mixture is the most suitable for standing up to the intensity of grazing practised. In the early period of sward establishment the stocking is controlled; but later on, when it is finally established, there is no control of grazing. The heavy concentration of stock, coupled with the absence of seeds of weed grasses, results in the perennial ryegrass/white clover sward persisting for a long time. Areas which were sown down more than twelve years ago still maintain reasonably pure swards based on the original seedings. Cocksfoot and timothy would not persist as pasture grasses under such uncontrolled and concentrated grazing. They have been used with success, however, on enclosed areas attached to farms where more reasonable control of the grazing is possible.

Breeding Quality Plants for Quality Seed

A. R. BEDDOWS, M.Sc., F.L.S.
and
GWILYM EVANS, O.B.E., M.Sc.
Welsh Plant Breeding Station, Aberystwyth

Many new plants are produced at the Welsh Plant Breeding Station but, as this article shows, the breeder's interest extends far beyond the trial grounds.

WHEN the late Sir George Stapledon and Professor T. J. Jenkin examined the leys of Wales nearly fifty years ago they found that the herbage seeds then sown lasted only a short time, and that very soon Yorkshire fog, bent and miscellaneous weeds took over. They recognized the need for varieties which would meet the farmer's special requirements, and in course of time they produced a range of varieties *within* a species, each with a different growth rhythm. This gave a much greater flexibility in the management of leys, and a level of production more uniform than had hitherto been possible.

Their work led eventually to the establishment of the Welsh Plant Breeding Station. Since then, of the herbage varieties bred at the Station, fourteen varieties of grass and four of clover have been placed on the market, as well as eight varieties of spring oats and six of winter oats.

Grasses

Of the fourteen varieties of grass, it is sufficient perhaps to quote just a few examples to illustrate the pattern of development. In cocksfoot, three

varieties were developed: S.37, an early growing, erect, leafy hay type; S.26, a bushy, leafy, pasture/hay type rather later in coming to maturity; and S.143, a "mop" pasture type, especially valuable for its persistency under grazing conditions.

In perennial ryegrass the Station brought out S.24, an early-growing and early-heading pasture/hay type; S.101, a variety which is medium-late to start growth and to mature; and S.23, a late-heading, very persistent pasture type with high mid-May/mid-June and autumn production.

Another important grass is timothy, three varieties of which have been developed: S.51, a hay/pasture type; S.48, a pasture variety rather later in heading; and S.50, a diploid extreme pasture form valuable as a bottom grass.

These varieties whose growth is not so readily retarded by the short days, or by the lower temperatures of the late autumn and early spring, have already lengthened the grazing season, thus enabling the period of indoor feeding to be reduced. Among the further varieties being developed for this purpose are a perennial ryegrass, and a diploid cocksfoot with an enhanced capacity for autumn growth which can be utilized up to Christmas, also a cocksfoot for very early spring keep. Seed of all these will be available in due course. Tall fescue S.170 can help still further to reduce the period of indoor feeding by its ability to grow as soon as the days being to lengthen.

Legumes

As a result of the legume breeding work, four varieties of clover have been marketed; two are white—S.100, a medium-leaved, vigorous type, and S.184, which is small-leaved and gives a dense growth; and two red—S.123, a late-flowering Montgomery type, and S.151 a medium early type. The challenge to the breeder of red clover is the task of overcoming susceptibility to the clover-rot disease (*Sclerotinia trifoliorum*) and infestation by eelworm (*Ditylenchus dipsaci*).

By means of selection and hybridization it is hoped to produce a new variety of white clover which will have the vigour and height to compete successfully with the grasses. This should be of considerable benefit to the grazing animal by providing a more balanced herbage.

Another approach to the breeding of more vigorous varieties is by the use of chromosome-doubled plants for the production of polyploid varieties.

In both white and red clovers, varieties without the usual mark on the leaf are under way, and should facilitate the inspection of crops in the field for authentication.

The use of lucerne is restricted for several reasons; in the west chiefly because of the low pH of most of the soils and the high rainfall, and in the east of England because of the incidence of *Verticillium* wilt. Investigations are in progress to produce varieties resistant to these disabling factors.

Spring and winter oats

Amongst the eight varieties of spring oats and six of winter oats which have been put on the market, the three released most recently are Manod S.235, a spring variety which exhibits a high degree of resistance to stem eelworm (*Ditylenchus dipsaci*), mildew (*Erysiphe graminis avenae*) and crown

rust (*Puccinia coronata*); Penrhyn S. 234, a winter oat with a high yielding capacity, white grain of good size and feeding quality; and Pennant S.227, a stem-eelworm resistant winter variety for growing on soils of moderate to good fertility. This variety is specially recommended for use on land infested by stem eelworm. The breeders are also interested in developing a variety of oats to give early herbage production and also provide a subsequent grain crop.

The work on barley is concerned with a feeding variety having a stiffer straw, early maturing, and non-shattering grain.

Work is also in progress on a grazing type of rye for early growth and delayed head production, so that a longer period of utilization may be possible.

The brassicas under investigation contain a wide range of potential varieties which differ in their reaction to frost and in other important characteristics. By breeding, an attempt is being made to prolong the active life of the leaves in kale and rape: this will enable them to remain longer on the plant under severe winter conditions. The breeder is also using techniques to develop entirely new forms with greater leafiness and more edible stems. Another investigation on rape is centred on developing a variety resistant to club root disease.

From time to time the needs of the farmer change, and therefore the programme of the plant breeder must be adapted to suit current requirements. The degree of replacement of old varieties with new is a measure of the success achieved in plant breeding, and it follows naturally that the breeder's interest in his creations reaches beyond his trial grounds.

Need for official trials and certification

It is now recognized in countries abreast of current trends that a new cereal variety should not be released for general use until its merits have been clearly established in official trials. When a general distribution is made of new varieties which later are proved by official trials to be distinctly inferior to existing ones, the potential of the land is not being properly exploited and consequently the farmer's living is reduced. A good deal of prescience is demanded of the seedsman in planning the marketing of new varieties of proved merit. Farming is a serious business, and therefore there should be no place for "fashions" and "novelties" in varieties of farm crops. Holland and France, for example, prohibit the sale of new varieties until they have been proved worthy of a place on the Official List of Approved Varieties.

In breeding, and in making and maintaining official lists of approved varieties, it is desirable fully to recognize the need for varieties adapted to different levels of soil fertility and to local or regional climatic conditions, and to avoid taking averages from trials covering several contrasting environments. When farmers remain reluctant to discard some of the established types it may well be that they have found them more reliable in all kinds of seasons than the new. This has been observed on farms in hilly districts with low to medium soil fertility.

The Welsh Plant Breeding Station became convinced that the breeders' efforts could not reach full fruition unless the identity of the variety was properly safeguarded and maintained until it reached the consumer, and over 25 years ago it sponsored the formation of the first Seed Growers' Association

to authenticate cereal seed. As a basis for certification schemes, each year the Station provides the foundation seed. The consumer's interest and the breeder's reputation may be further ensured by checking the certified seed regularly for genuineness and purity of the variety, a procedure adopted in Sweden for many years.

The bred varieties of grasses and clovers made available from Aberystwyth during the past 30 years have made first-rate pastures of different types for various purposes, and yet they have not replaced the commercial varieties to nearly the same degree as have the new cereals. This tendency appears in other countries as well, unless appropriate measures are taken, and it points to the fact that much more international trade is done in cheap surplus seed of herbage plants than is done in seed corn. Much of the surplus seed is less adapted to the importing country than to the country of origin, which often has a different climate, and thus much harm has been done to agriculture. Holland is an example of a country that has taken statutory powers to prevent the use of inferior varieties. All varieties are officially screened and only those best suited to the climate and soil of the country are placed on the List of Approved Varieties. It is illegal to import or to sell seed of other types.

The thorough assessment of each grass and clover is admittedly a very expensive process. It has been concluded, however, that official trials are more effective, quicker, and less costly to the national economy than leaving the task to the farmer. So many factors are involved that it is even less within the competence of the farmer to distinguish between the higher and lower grades of herbage varieties than it is to do so for the cereals.

The authentication of herbage seeds is even more important than it is of cereals, and the Welsh Plant Breeding Station in 1940 established the Inspection and Seed Certification Scheme throughout the country for seed crops of its bred varieties. The Station also established the principle that for herbage varieties the number of generations from the breeder's basic plants to certified seed should be kept to the minimum, and it is now possible for some varieties to be available to the farmer as early as the third generation.

Great care is required in handling the different kinds of herbage seeds, some of which appear identical, and measures have been taken in various countries to ensure that the seed supplied genuinely corresponds with its name and description. Undoubtedly the interest of the careful seedsman, as of the breeder and the farmer, is protected by sampling certified seed as it is delivered to the farm to check trueness to type, although for some species the process of checking may take a year or more.

Several countries, including the United States and Canada, have found it necessary to prevent undesirable blending of foreign types with their own superior varieties, and therefore they insist that all imported red clover seed is marked with a bright dye at the port of entry, so that every seedsman and farmer can recognize its foreign origin at a glance.

The keen farmer is more likely to secure the seed of his choice by ordering in good time. He makes sure of obtaining the certificate number of each lot, and of having each variety delivered in separate bags, properly labelled with its name, etc., for mixing on his own barn floor well in advance of sowing time. He may even have samples taken of delivered seeds for checking their genuineness. Crop improvement reaches a high level when the plant breeder's efforts are officially encouraged, and fully supported by farmers and seedsmen.

A Better Raspberry Crop

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An authoritative article on the production and marketing of better raspberries, bearing in mind the importance of the crop to the canning and quick freezing industries.

UNTIL recently in Scotland, and to a less extent in England, most of the raspberry crop has been sold as pulp, preserved with sulphur dioxide, for the manufacture of jam. A decline in the consumption of jam and an increase in the amount of fruit produced by better methods from a larger acreage has forced the price of raspberry pulp down to an uneconomic level. This has led to an increased interest being taken in what is known locally as the basket trade, the sale of fresh fruit for canning, quick freezing and to the wholesale markets. Fruit for these purposes must be free from damage by pests and diseases, of higher quality and more carefully handled than fruit intended for jam manufacture.

Raspberry varieties

The choice of the variety to be grown affects the quality of the fruit more than any other factor. Until recently a very large proportion of the acreage was devoted to Promise and Exploit, which are generally too soft for the basket trade and were marketed mainly as pulp. The remainder of the acreage was planted with dual-purpose varieties, which have firm textured fruit and do not disintegrate after being processed. Into this category come Jewel, Burnetholm, Malling M., Enterprise, Lloyd George and Norfolk Giant. Today, except on the larger raspberry farms where it is a physical impossibility to pick more than a very small percentage of the crop in baskets, the dual-purpose varieties are being planted to the exclusion of Promise and Exploit. Fruit growers with smaller acreages pick as large a proportion as possible of their fruit in baskets as the weather allows, the remainder to be sold for pulp.

Jewel is by far the most popular dual-purpose variety. The fruits are particularly easy to pick, for they are seldom obscured by the leaves and the new canes do not hinder the pickers. They are a medium red in colour, with a very firm texture. Unless handled very carelessly they do not squash or break. Jewel is preferred for canning and quick freezing to all other varieties that are available in any quantity. The fruit travels well to market, but the colour darkens overnight and loses its lustre.

Unfortunately, Jewel has a relatively short cropping season, and in a little over three weeks the crop is over. A preponderance of the acreage devoted to this variety will not only create picking problems for the grower but will reduce the amount of fruit that can be processed or sent to the wholesale markets for a reasonable return. This position will be made worse by the disappearance of Exploit and Promise, which ripen ten days before Jewel.

The only variety that can be planted to extend the picking season materially is Norfolk Giant. This has never been very popular in Scotland, as the weights of commercial crops have been well below those of earlier varieties. It is expensive to pick, ripening when the piece-work rate is at its highest and when pickers have lost their enthusiasm for the work. Finally, in August loss of fruit due to wind and rain is an increased hazard. The fruits are medium to small in size, of a rather dull pink colour which does not darken. The fruit is satisfactory for canning and freezing, and of a firm texture which allows it to travel to market in good condition.

The remaining varieties have much the same period of ripening as Jewel—perhaps slightly longer. The reasons for growing these are that it is not wise to be dependent on one variety, and that they help to even out the daily deliveries of fruit because they will not be ripening at exactly the same time as Jewel.

Enterprise is similar to Jewel in many respects, but it does not crop as heavily and the fruit is larger, of a medium red colour, which darkens quite rapidly. Where Jewel grows satisfactorily there appears to be no advantage to be gained by planting Enterprise.

Although stocks of Malling M. were released from East Malling with the other Malling varieties, it has only attained prominence in recent years. Locally it is now an important dual-purpose variety. The fruit is of medium size, of a good bright red colour, with little tendency to darken after ripening. It is conspicuous and easy to pick, though the fruit must be handled slightly more carefully than that of Jewel. It travels well to market, where it retains its bright colour. In years of drought the fruit may be small, and in a very wet season may lose some of its texture.

Like those of Lloyd George, the flower-buds of Malling M. are easily killed by spring frost, but unlike the former no second fruiting lateral is produced, therefore it is not a variety to plant in situations where spring frosts occur. Malling M. and Lloyd George are the only two varieties immune to infection by soilborne virus diseases.

Lloyd George has not attained great favour in Scotland. It is said that the fruit is smaller and less firm than that produced by pre-war stocks of this variety. Although the Special Stock canes can produce heavy crops, its general performance has been disappointing. Pickers have difficulty in finding all the fruit amongst the mass of new canes and foliage, so that when picked again the sample of fruit may be of an uneven ripeness. The fruit is now inclined to be soft, and squashes easily unless picked very frequently and under strict supervision. The canning and freezing companies are not so willing to buy this variety now that larger quantities of others more suitable are available.

Burnetholm Seedling, all stocks of which are severely infected with virus, has been the main variety for many years in the Clyde Valley, where a very large proportion of the fruit has been sold to the wholesale markets. The fruit is not large, but it is very firm and a pink-red colour which does not darken. The new canes are sparse, and as the fruiting canes have little foliage it is extraordinarily easy to pick. The fruit is equally satisfactory for canning and quick freezing. As a new virus-free stock of Burnetholm has been produced and distributed by the Scottish Horticultural Research Institute, this variety may come back into prominence in other fruit-growing areas.

While Exploit and Promise will never be suitable for canning, they will continue to be grown to a limited extent for the fresh fruit markets until an early dual-purpose variety becomes available. Those growers who can command a sufficient number of skilled workers and pick their plantations every day are able to market fruit of good quality, which obtains high prices, particularly at the beginning of the season. It appears that in the drier climate of England, Exploit and Promise are more suitable for basketing as the fruit is firmer in texture, though smaller.

This change of emphasis from selling raspberries for manufacture into jam to their sale for canning, quick freezing, and as fresh fruit, has altered the growers' requirement for varieties. Whilst there is more than a sufficiency of dual-purpose, mid-season varieties, there is a pressing need for a new dual-purpose early variety. A new heavier yielding, more reliable variety, that could replace the later Norfolk Giant, would also be desirable.

Pre-cooling

The quality of fruit when delivered at the wholesale markets can be improved by pre-cooling on the farm before despatch. Experiments in the technique of handling and cooling of soft fruit, carried out by the Ditton Laboratory, have shown that the process of ripening and fungal rotting can be greatly delayed by cooling and storage in a 20 per cent concentration of carbon dioxide. The cost of a suitable cooling store represents a capital investment of between £50-£100 per acre, according to the size of the farm. A grant of one-third of this cost can be obtained under the Horticulture Improvement Scheme. This is a high capital investment, particularly when in the case of raspberries the store may have only six weeks' use. Experience last year appeared to show that the investment is justified. On a mixed holding, where the store can be used at other times of the year, its erection can be fully justified.

A small number of cool stores were erected in the Dundee area and used during the fruit season last year. Experience showed that possession of a cool store not only improved the fruit quality but enabled the problems of picking the fruit to be handled with greater flexibility.

It was not possible to obtain market assessments of the differences between comparable samples of cooled and uncooled fruit. In one market at least, buyers learned of the differences and asked for cooled fruit. Uncooled fruit turns a darker colour, sinks down more into the punnets and loses more weight than cooled fruit. On one occasion raspberries were cooled and stored on the farm overnight and dispatched to London. As the train arrived late, the fruit was kept for a further day and only sold three days after it had been picked. It was still in better condition, less mouldy and lighter in colour than uncooled fruit which had been picked 24 hours later.

The greatest handicap for Scottish—and some English—growers is the long distance that fruit has to travel to market. This shortens the length of the picking day, and the margin for delays in transit is so small that fruit often arrives late at market. A cool store enables these difficulties to be surmounted. Picking can continue until late into the evening, the fruit cooled, stored overnight and despatched without haste on an earlier train which will have more time to arrive at the market.

A cool store will also give advantages to the grower who undertakes to supply fruit for canning and quick freezing. Now that these companies are being offered more fruit than they require, they will collect only a minimum quantity and not after 3 p.m. Fruit can be stored in better condition in a cool store than in the open and held until sufficient is available to warrant collection. Picking can go on after 3 p.m., and the fruit stored overnight in readiness for collection in the early morning, at a time when factories are usually short of fruit.

Punnets, chips and trays

The kind of container used has an important bearing upon the condition of the fruit when it arrives at the market. Although cardboard chips and punnets are the cheapest, and fruit can be marketed successfully in them, they are not regarded favourably by anyone who handles them after they leave the farm. They are more flimsy and harder to handle than veneer punnets and chips, as they absorb the juice and can collapse completely when wet. Market surveys have shown that veneer chips and punnets are considered to be the best type of container by all sections of the trade.

Several tons of raspberries were sold last season in ½ lb plastic punnets. These gave every satisfaction to all concerned, partly, no doubt, because the fruit had been picked in perfect condition. Except for sale to local shops, 1 lb plastic punnets have not been found satisfactory for strawberries, and they would be even less satisfactory for raspberries.

A suitable non-returnable tray must be very rigid, strong enough to withstand rough handling and stacking to a fair height, not unnecessarily difficult to erect, and well ventilated. Only one type of tray used last year was sufficiently well ventilated. The bottoms of most of the larger trays belly downwards with the weight of the fruit, and squash the berries in the tray below. A cardboard stretcher is supplied with some types of tray to prevent this happening, or a wooden flower cross-stick can be put in by the grower to serve the same purpose. Few trays were strong enough to be stacked more than four or five high.

The cardboard tray presents even greater difficulties to the grower who pre-cools his fruit. If the store is to be filled to capacity, trays must be stacked five feet high. Cardboard trays cannot be stacked to this height without the lower ones buckling or being severely weakened. As the majority of them also have insufficient ventilation, the cooling machinery cannot be operated at maximum efficiency.

The best type of cardboard tray for use in cool stores is a semi-returnable one which is fitted with detachable metal corners. These corners are removed by the salesman when the cardboard section of the tray is sold with the fruit, and returned to the grower. Such trays allow air to circulate satisfactorily round the fruit, and they can be stacked as high as wooden trays in cool stores, lorries and railway wagons.

Second-hand Dutch tomato trays are very popular, and generally cheaper than cardboard trays of similar capacity. Their stability can be improved by sawing triangular pieces off the bottom boards at each corner. Labels, suitably inscribed, should be pasted over the Dutch trade marks.

Grey mould and raspberry beetle

Although various pests and diseases may severely reduce the weight of crops of raspberries, only grey mould and raspberry beetle directly affect the quality of the fruit.

The feeding of the adult beetles on the flower-buds and open flowers gives rise to distorted fruits which have to be discarded during picking. Eggs laid on the setting fruits hatch into larvae which feed on the ripe berries, and put off the intending purchaser.

If large numbers of beetles are present in plantations, spraying is carried out as soon as the infestation is seen or ten days after the first flowers open, and repeated ten to fifteen days later. When the beetle has been kept in check by annual applications of insecticide, the pest may be controlled by a single spraying, applied when the first fruits begin to colour.

DDT has been used almost exclusively for controlling raspberry beetle in Scotland. However, in the drier and warmer climate of England the use of DDT may lead to serious outbreaks of red spider.

Recent trials and experiments have shown that malathion is equally effective in controlling beetle. Outbreaks of red spider are less likely to occur following its use, and where spraying is carried out at the pink fruit stage, the residue of insecticide will be less than with DDT.

Grey mould takes a heavy toll of unripe and ripening fruits during periods of wet or humid weather, and apparently sound fruit may become infected with the fungus whilst travelling to market. Attacks appear to be severe in overcrowded plantations, which have either been too closely planted or received excessive applications of nitrogenous fertilizer, or where too large numbers of new canes have been allowed to grow.

The incidence of grey mould can be reduced by spraying with captan or thiram. The first application is made after the first flowers open, and three further sprays are given at ten-day intervals. These fungicides must not be used in plantations where the fruit is intended for canning or deep freezing.

HORTICULTURAL CO-OPERATIVE MARKETING

The Report of a Departmental Working Party on *Some Problems of Horticultural Co-operative Marketing in England and Wales* was published by H. M. Stationery Office last month (price 1*s.* 9*d.*, by post 2*s.* 1*d.*).

It reviews the various incentives and sanctions that could be used to induce members of growers' co-operatives to give more support to their societies, especially in observing contracts for the supply of produce. The report concludes that the sanctions already available are adequate and that there is no need to extend them by further legislation. Although the Working Party recognize that the loyalty of members contributes much to the success of their societies, they believe that this loyalty must depend largely on the business efficiency of the particular co-operatives. They suggest a number of ways in which societies could improve their organization. Some of these could be of especial interest in view of the increasing attention being given to co-operative marketing at the present time.

Tulip Bulb Production

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An expert's view of some new varieties and some new—and old—techniques.

EVERY spring, thousands of people visit public parks and gardens to admire tulips of every type and colour. Suitable labels bearing the names of the different varieties and cultivars enable them to note their preferences, and thus eventually influence demand when they buy bulbs and flowers for home and garden. The presence of new kinds of tulips is always of special interest, and is equally important to the commercial bulb producer or flower grower who tries to keep abreast of new developments to meet market requirements.

Foremost among the recently introduced types the Darwin Hybrids' have made a great impression. Apeldoorn, London, Oxford, Dover, Parade, Holland's Glorie and Lefeber's Favourite all have large, strong-stemmed scarlet flowers which are certain to be in great demand for garden use. Gudoshnik, of similar parentage, has the unusual colour combination of creamy peach with deep rose edging to the margins of the petals. Some of these varieties are already being forced for the flower market, but it is too early yet to forecast what their ultimate status will be.

In the Darwin group, Paul Richter, Red Pitt, Queen of Bartigons (pink), Sweet Harmony (lemon yellow, edged ivory) and Pandion (purple edged white) are but a few of the kinds becoming better known. All commercial tulip growers have their favourites, but Elmus (cherry red, edged white) and its sport Auriola (bright red, edged golden yellow), Red matador (fiery red), Merry Widow (deep red edged pure white) and Bruno Walter (brownish orange) have a wide appeal as excellent Triumph tulips, with Her Grace (bright pink), Orange Wonder, Rynsoever (gold) and White Sail among the Mendel varieties. Bellona, one of the best deep yellows, is an attractive single early tulip, and Commandant Den Ouden is a fiery red early double, suitable for formal beds.

Lily-flowered tulips are becoming more in demand, and the ruby purple Captain Fryatt now has Aladdin and China Pink as rivals, while of the late May-flowering or cottage tulips the refined pure pink of Smiling Queen, and the magnificent Princess Margaret Rose (deep yellow)—a sport of Inglescombe Yellow, which has bright scarlet-edged petals—are outstanding. Even the seedlings of viridiflora Cherie, Court Lady and Pimpernel have revived interest in an old type of tulip in which green mingled with some other colour is a characteristic of the flower.

The Parrot Tulips have improved in recent years, and the colour range now includes red, orange, pinks and lilac, with Queen of Parrots (pink), Kathleen Ferrier (rose) and Blondine (creamy yellow) to compete with the known favourites, among which Texas Gold is excellent.

No commercial grower can produce stocks of all the different kinds of tulip bulbs and flowers since there are too many of them, and for quite a number there is no steady demand. Also, despite the beauty of tulips in a

garden, they may be unsuitable for out of season production as forced bloom. Ultimately, however, when the commercial value of a variety has been established by prolonged trials, the essential fact has to be appreciated that stocks must be increased, and for all purposes the bulb is the primary product. The production and maintenance of healthy stocks is both difficult and costly, requiring special knowledge and skill and adherence to the highest standards of plant hygiene.

Controlling tulip "fire"

Though the use of fungicidal sprays for controlling tulip "fire" is a recognized practice, the prior removal of all bulbs visibly affected by the disease is essential. Moreover, the removal of bulbs showing symptoms of infection by viruses is the only means of keeping tulip stocks virus-free, though supplementary measures to control aphid vectors have also to be used. Routine inspection of the growing plants, with a view to removing and destroying any that are likely to lower the standard of health, purity and vigour of the stocks is imperative, and the task should only be entrusted to operators who have been specially trained. In bulb-growing areas the N.A.A.S. offers assistance in such training.

Mechanization

A feature of the new methods of crop production that have been adopted in the post-war years has been the greater use of machines in the planting and lifting of bulbs. One method involves a departure from the use of the traditional bed in favour of ridges similar to those used in potato production, but with the bulbs more closely planted in the furrows, which become ridges when the soil is replaced. Though this method makes less demand upon manual labour it increases the difficulty of roguing, and it seems highly probable that the stem and bulb eelworm capable of attacking tulips[2] may be encouraged if slight infestations occur, and attacked plants remain in the land at lifting time.

Few suitable weed-killers

The control of weeds in tulip crops is a hazardous operation even when manual labour is employed, hence the advantage of using herbicides. However, great caution is necessary since very few of the available herbicides are suitable. It is only within the past few years that an effective herbicidal programme for tulips has become possible,[3] largely through experimental work conducted at Kirton and Rosewarne, the two N.A.A.S. experimental centres specially concerned with bulb-growing problems.

It is possible to use a herbicide which kills seedling weeds by contact before the bulb shoot emerges at the soil surface. The most useful herbicide for this purpose is pentachlorophenol emulsion. A good control of weeds can be obtained for many weeks. Just as the tulip shoots are emerging, and definitely before the leaves commence to unfurl, chlorpropham (CIPC), a herbicide of a different type, which acts through the roots of seedling weeds and has a prolonged period of residual activity, will suppress chickweed until the end of April. The materials are applied as sprays at a rate of 100 gallons per acre

but when using any herbicide the manufacturer's instructions should be strictly followed.

With the efficient control of weeds by the use of herbicides the need for surface cultivation as a sound commercial practice becomes a matter of controversy in which no decisive evidence can be given. Tulip production is a special branch of flower-growing, and far from being an easy and simple occupation it is one that presents difficult problems for which as yet there are no satisfactory solutions.

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Soil Problems in Potato Mechanization

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Clods are a nuisance from planting to harvest time. How are they caused, and how can they be prevented?

THE mechanization of potato growing is lagging behind that of most other arable enterprises. In cereals, fodder crops and even in sugar beet, machinery has so greatly reduced the peak demands for labour that quite new systems of management have become possible; but in potatoes there has not yet been any great easing of labour demand.

The difficulties in the way of developing the machinery for potato work are very largely connected with the behaviour of soil in one way or another. For example, in harvesting, the kind of soil in the field can make more difference to the performance of a mechanical harvester than the design of the machine itself.

The type of the soil is something that a farmer can do nothing about, but condition is no less important than type. This was shown in the contrasted harvesting seasons of 1959 and 1960. On some farms in 1959 the soil was so dry that it was hard to keep enough fine earth with the potatoes at the digger to protect them from abrasion by the machine or by sharp hard clods. On the same farms in 1960 the soil was so wet and sticky that it was difficult to separate potatoes from soil at all.

The amount of water in the soil at planting time and the size of soil aggregate at harvesting can both be controlled to some extent. The conditions desired are known. The seedbed for potatoes must be fine and moist. Clods can prevent close contact between soil and seed, and they can provide inter-clod pockets where concentrations of fertilizer remain in contact with the seed and cause scorch, especially when chitted potatoes have been planted.

Clods spoil the uniform covering of soil when the potatoes are earthed up, and at harvest time it is the presence of clods which makes mechanical separation of potatoes from soil so difficult. In an exceptionally dry harvest, clods can become so sharp-edged that they cause as much mechanical damage as stones.

How clods are formed

It is worth while, therefore, to enquire how clods are formed, how long they persist towards harvesting time, and how their presence can be avoided.

At an early stage of the cultivations for the seedbed, the breaking up of masses of soil can produce aggregates of soil that are too large for the seedbed. Cultivator tines working below the plough level are very likely indeed to bring up clods measuring between three and eight inches across. The same possibility of breaking up the mass of soil into lumps occurs again at harvesting time if the digging shares are set below the cultivated level.

Clods can, however, be manufactured from fine soil. The wheel or track of a tractor inevitably displaces and compresses damp soil, though the effects are not often serious enough to cause a pan which can hold up drainage or hinder root penetration, because the wheel pressure is dissipated at a very short distance below the surface; but when soil has become only slightly compacted, and has been allowed to dry out undisturbed, it may break up into a series of pillars which could become troublesome clods. A tine behind the tractor wheel, clamped to the frame of the tractor or the plough, can stir the soil in the depression sufficiently to prevent the formation of a continuous compacted layer.

There is also a more direct way in which the use of pneumatic tractor tyres may lead to clod formation. In some conditions of moisture content, soil takes an impression of the tread of a tractor tyre, so that after the tractor has passed over the land there is left a kind of gear rack in which the tread bars of the tyre have engaged. A plaster cast of such an impression will have an outline similar to that of the rubber tread bars on the tyre. If the tractor was running free, and pulling no load, the distance between each tread bar on the plaster cast is about the same as the distance between the tread bars on the tyre. If, however, the tractor was pulling a large enough load to make the wheels slip slightly, then the distances between the plaster tread bars are shorter than that between the actual rubber bars on the tyre by the same proportion as the proportion of slip taking place. If the tyre has been working with five per cent of slip, and it is rare for a tyre on a tractor pulling any load at all to be slipping less than this, the distances between the tread bar impressions will be shortened by five per cent, and the width of the tread bar impressions themselves will also be shortened. Compressions must have taken place horizontally. The projections of soil in the pattern left by the passing of the tractor tyre have suffered compression vertically by the weight of the tractor, and horizontally by the shortening just discussed. This could produce compressed aggregates of soil.

Pneumatic tyres may form clods in another way. If the tyre tread bars were rigid like steel lugs, the spaces between them would soon become filled with soil and the tyre would lose its grip. What prevents this from happening is that the rubber tread bars bend sufficiently to dislodge the soil, and it is ejected in the form of compressed pieces of soil which may become clods.

During inter-row cultivations, clods can be formed by the tractor wheels and also by the action of the implements themselves. In some soil conditions the action of the mouldboards of the bouting plough can compress the soil into clods. The American lister shape of mouldboard seems to pulverize the soil more, and produce fewer clods than our orthodox mouldboards.

Avoid time-lag in spring cultivations

In some seasons at planting time it is very difficult indeed to make the soil fine without at the same time making it dry. All methods of working soil are done at the expense of moisture loss. When land has been ploughed in the autumn, and the furrows are broken up in the spring by the cultivator working across them, the moist soil brought to the surface quickly loses its water content if the atmosphere is warm and dry.

Spring cultivation should be delayed until just before the ridges are to be drawn and the potatoes planted. In the Fens, a method that is gaining popularity relies on the autumn ploughing having been done at a greater depth than any of the later cultivations are likely to reach. At planting time a fixed tine cultivator, perhaps with a harrow towed behind it, breaks down what is left of the furrow slices. A rotary cultivator is then worked in the same direction as the fixed tine cultivator was used, and behind that comes the potato planter. With a sufficiently large team of men and machines, less than 20 minutes elapses between the time that the soil is first broken up and the time the potatoes are safely set.

The best moisture content for the physiological needs of the potato at planting time is often quite near the moisture content most likely to lead to compaction of soil and to clod formation. This means that if a 3-row planter is used behind a wheeled tractor, two of the three rows, being directly in the track of the tractor wheels, are often left undesirably compacted. This does not happen with a two- or four-row planter because in those cases the tractor wheels run where the furrows are going to be. With three-row equipment it is worth taking precautions to avoid compaction. Using a tracklaying tractor instead of a wheeled one is expensive, but quite a few farmers think it justified, and it is certainly effective. Cheaper ways are to use cage wheels to take the weight of the tractor away from the row, or to set the wheels of the tractor as wide apart as possible. Yet another method is to use a tine to stir the surface of the soil at the depression, just as can be done at ploughing.

Harmful as clods may be at planting time they become more noticeable at harvest because they influence the mechanical separation of potatoes from soil. Investigations have been started to find out how many clods break up into finer soil during the potato growing season, and how many persist to the harvest. So far the trials have been made only in a small range of soils and only for one year, but it appears that in 1960 many clods broke down during the season. This was on peat and silt soil, and it happens also that on the farms on which trials were made the farmers carried out as few down-the-row operations as possible.

Soil as a buffer against mechanical damage

The prevention of damage to potatoes during harvesting and storing has become almost as important as the saving of peak demands of labour. Some

believe that damage has to be accepted if labour is to be saved by the use of a complete harvester, but there is no reason why this should be so. We must remember, however, that as soon as the potato is taken out of the soil which has been protecting it from abrasion and even from sudden changes in temperature or moisture, it is extremely vulnerable. The best way to look after the potato is to keep as much soil as possible with it for as long as possible during this critical period when the potato first leaves the row. In some conditions this provision of an adequate cushion of soil may be incompatible with easy mechanical separation from clods and haulm. Skill in the use of a potato digger or a complete harvester lies very largely in knowing the best compromise in the amount of soil to carry over with the potatoes.

We do not yet know exactly where the greater part of the damage to potatoes at harvest time is occurring, but investigations have been started which may provide a useful guide when they have been made in a sufficient number of soils and in different conditions of those soils. Samples are taken at suspected danger points in the harvesting process, and the samples are treated with para-cresol, which stains damaged tissue pink. The percentage of the surface area affected is estimated by a comparison with charts, and the amount of damaged tissue is weighed and stated as a percentage of the total weight of potatoes being harvested.

The results of investigations and experiments of this kind will help in the design and operation of potato machinery. In the meantime, sufficient is known about the subject for some clear pointers to emerge. It is certain that at planting time, during the season of growing, and at harvest, the soil must be kept as free from clods as possible.

Farm Circuit Schemes

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National Agricultural Advisory Service, Derbyshire

Seeing the other man's farm and discussing his problems on the spot can lead to ideas of better management, as this account of inter-farm visits in Derbyshire shows.

POOR shallow soils, high altitudes and damp conditions make farming in N. Derbyshire very difficult. The majority of farms are small, and they have to rely on milk production as their main source of income. Profit margins tend also to be small and there is tremendous scope for improvement in all aspects of farm management.

Get-together visits

Farm management advice has been, and is being, given successfully by the N.A.A.S. through its normal channels, and the opportunity for giving individual advice has been increased by the considerable number of approved Small Farmer Schemes in the area. There are heartening signs that the more

reserved farmer's attitude of mind towards his business is slowly altering, but it was felt that a fillip could be given by employing the circuit scheme technique which is being used successfully by the British Productivity Council to spread knowledge about increasing efficiency among industrial firms. These circuit schemes involve exchange visits among business concerns and have recently been applied to some specific farming operations.

The first farm management circuit in north Derbyshire was developed by two N.A.A.S. District Advisory Officers with the co-operation of the Buxton and High Peak Productivity Committee. Five farmer members of this committee's agricultural section agreed to form themselves into a pilot circuit designed to provide us with experience in organizing and running such schemes. The five farmers met on each other's farms at fortnightly intervals during the winter of 1959-60 to examine their methods of producing winter milk and discuss ways of reducing costs. The visits usually began by a short introductory description of the farm, either by the host farmer or the D.A.O. This was followed by a walk round the farm buildings and an inspection of the livestock and equipment. The meeting ended with further discussion over tea and cakes round the fireside.

After a few visits, when the circuit members had got to know each other, farm accounts were introduced, together with a simple analysis of the main enterprises. An agricultural economist was invited along to help explain the data and, once these were understood by the farmers, great interest was shown in the budgets and several useful suggestions were put forward to increase the particular farm's income.

All those who attended this series of get-together visits agree that the time was very well spent. Indeed the farmer members have asked whether it would be possible to make their circuit an annual one and bring their other enterprises fully into the discussion. They consider that now they have got to know each other and the farm businesses concerned, subsequent rounds of visits should be even more valuable than the first, particularly if full use is made of the University Economics Department officers and the N.A.A.S.

Having successfully launched the milk production circuit, a series of visits was arranged among a group of keen Young Farmers who had recently started dairy farming on their own account. All were interested in rearing their own herd replacements and it was decided to choose the economic aspects of this enterprise as a suitable basis for the visits. This circuit was run on more formal lines than the first one, in that each farmer was asked to complete a questionnaire which was used by the circuit organizer as a programme for the visit to his farm. All aspects of the subject were covered, from the herd breeding policy to the detailed costs of rearing each calf. Budgets showing these costs were prepared from the questionnaire and members soon became used to interpreting them.

As a result of the arguments put forward during this circuit, three of its young members agreed to alter their entire policy of housing and feeding so that they can bull their heifers at a much earlier age than had previously been possible.

Anticipated progress

This inter-farm visiting encouraged the idea of forming a circuit among a group of small farmers in one of the poorest districts in the county. Five

farmers, all family men in their late thirties, were invited to join. A member of the milk production circuit was asked to act as joint organizer with the D.A.O. This farmer quickly made friends with the others and proved to be of outstanding help in running the circuit.

Four members of this circuit had had Small Farmer Schemes approved and the D.A.O. knew that their businesses could be made much more efficient. The main subject chosen for discussion, therefore, was ways of increasing each farm's net income, and simple budgets were shown where it was thought that they would help. Visits were arranged in the evenings at weekly intervals during last summer and, once the ice had been broken, it was gratifying to see how well all the members got on with one another. There is no doubt that this was mainly responsible for the success of the scheme. The circuit ended with a visit to the farmer-organizer's farm, where the small farmers could see many of the ideas they had discussed actually being put into practice.

So far circuits had been initiated by inviting selected farmers to participate. Last summer, however, a scheme on grassland management was formed by arranging a meeting at a local hotel and inviting along those people who might be interested in visiting each other's farms to discuss this subject. No less than ten farmers asked if they might take part. During the subsequent farm visits the main theme discussed was the means of reducing milk production costs by growing better grass. Budgets were prepared to illustrate the costs of producing and maintaining the various grass swards seen and to show their value in terms of milk and livestock sales. The members of this circuit were young progressive farmers and, as was expected, the visits achieved their objective and will, it is hoped, pave the way towards the formation of other circuits of a similar type.

Now that this network of inter-farm visiting is spreading among the dairying section of the farming community, increasing attention is being focused on the upland livestock-rearing farms. Last winter a successful series of visits was arranged between six of the more progressive hill farmers to discuss the management and marketing of hill cattle. We hope that as with the initial milk production circuit, other farm visiting schemes will branch out among the less well-informed hill farmers.

Most of the work of managing these circuits has so far been borne by three D.A.Os, who are in close touch with the farmers and are therefore best able to make the necessary arrangements. During each visit among the more progressive farmers it has been found advantageous to have a leader present with technical qualifications and some experience in farm management. He can ensure that the discussion is going along the right lines and that useful conclusions are being reached. This role has been filled usually by one of the D.A.Os, with the occasional help of other N.A.A.S. specialists.

Although even the most up-to-date farmers can learn a great deal from each other when they visit in small groups, perhaps the most rewarding work is that done amongst the more traditional type of farmer who is slow to accept farm management advice. It is intended to make a special effort to encourage as many as possible of these farmers to join circuits. The advisory needs of the small farmers are very simple, and it may well be that some of the more technically minded farmers who have now had experience in running a circuit will be able to conduct the visits among their neighbours. This would

relieve the D.A.O. and enable him to hold a watching brief over several circuits running simultaneously.

Effectiveness of farm circuits

The success of a circuit depends largely on the suitability of its members, and it would seem that having chosen a subject the organizer should actually pick his own farmers rather than extend a general invitation. He should take care to choose as wide a range of farmers as possible to ensure an abundant exchange of ideas. This is undoubtedly contributing towards the success of our milk production circuit, whose members include three traditional farmers, a technically trained manager of a large estate and an industrialist who has been farming profitably in the locality for several years.

Circuit members have asked for repeat visits and shown a willingness to participate in other schemes, and this fact suggests that the innovation is proving itself to be popular. One reason for this is, of course, the social implications of exchange visits. Given the opportunity, most farmers naturally enjoy discussing their affairs with each other.

Apart from these social aspects, circuits provide interesting experience in human psychology. Although not exactly an individual approach to advisory work, they have a great advantage over the formal group approach in that each member acts to some extent as an adviser and thus feels he is playing a useful part in the scheme. We feel that this should be encouraged as much as possible by the circuit organizer, who should regard himself mainly as a co-ordinator and technical authority.

The main limitation of the circuit scheme is that it helps to spread information only among a small section of the farming community, whereas a farm walk may be able to show a farmer's improved methods to several hundreds of his fellows. This failing can perhaps be offset to some degree by the circuit organizer's recording the useful ideas exchanged and employing them both in his day-to-day contacts with other farmers and as the basis for farm walks or winter meetings.

Much has been written on the individual, group, and mass approaches to advisory work. Each has its own advantages and limitations. The farm circuit could perhaps best be included as a useful supplementary method of disseminating information on improved farming methods. Impressions gained by farmers during circuit visits are strong ones, and they could well prove useful tools in developing a more positive attitude of mind to the whole question of farm business efficiency and farm business management. Once this has been achieved, the way will be open to the more ready acceptance of advice given by whichever method is thought to be most suitable.

Zero Grazing at Seale-Hayne

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These first results of investigations at Seale-Hayne into the problems of zero grazing will interest farmers contemplating it this year. Work began in 1959 and is still going on.

THE term 'zero grazing,' which was coined in America, is only another name for the ancient practice of "soiling" to be seen today on many Swiss and Central European farms. Reports on it published during the last 150 years, were reviewed by Watson and Runcie in 1960.*

Three factors are responsible for the current interest in zero grazing. First, there is a need to investigate any technique that might improve the efficiency of grassland use. Second, developments in farm machinery have reduced the labour demand for cutting and carting large quantities of green fodder. Third, developments in the twentieth century have made it extremely difficult on some farms to move cattle freely from pasture to milking shed.

If zero grazing is shown to have advantages over conventional grazing, these are likely to result from the effect of one or more of the following factors:

1. The elimination of mechanical damage to the pasture from the treading of cattle.
2. The elimination of pasture contamination by dung and urine.
3. The more complete utilization of the herbage grown, that is to say no selection.
4. Rapid defoliation, allowing the maximum time for regrowth.
5. A saving in the energy normally expended by cattle in grazing.
6. A greater knowledge of the quantity and quality of the herbage consumed.
7. The efficient utilization of high yielding arable crops which are unsuitable for grazing.
8. The production of farmyard manure for cash crops.

The potential disadvantages of zero grazing are:

1. The probable extra cost in both man- and tractor-hours.
2. Greater capital requirement on some farms where suitable buildings and mechanical equipment are not already available for winter housing and silage-making.
3. Possible adverse effects of zero grazing on the general health of cattle.
4. The problem of supplying extra bedding material for the summer period.
5. An increase in expenditure on artificial fertilizers when farmyard manure produced from zero grazing is used on the arable land.

Study of technique

The investigation conducted during the last two years was designed to provide information on a number of aspects of zero grazing. This necessarily meant that certain compromises had to be made. It was not possible to provide for the highest labour efficiency and at the same time collect the data required to study the reaction of cattle to zero grazing.

*Soiling or Zero Grazing. S. J. Watson and K. V. Runcie. *Outlook on Agriculture*, 1960, II, 264-75.

An existing open-fronted shed was adapted. This shed was 60 feet long and 30 feet deep, and open on the north side (see p. i of the art inset). A feeding area was constructed to provide 80 feet of trough space, the troughs being made of elm board. The adapted building can house up to 30 cows, although it has never housed more than 24 during the summer. The covered area of the yard was littered with straw, but the open space adjacent to the feeding troughs was not littered and the concrete was swept each day. When housing 30 cows the arrangement would provide 60 sq. feet of bedded area and rather more than 2 ft 6 in. of trough space per cow.

The same two fields were used for zero grazing in both years. The first field was a long ley on flat, low-lying ground; the second was a timothy, meadow fescue and clover ley which was established in 1957. Both leys were grazed by the ewe flock during the winter, but between April and October, inclusive, all the grass produced was cut either for zero grazing or for silage. In 1959 the fields received dressings of fertilizer equivalent to 4 cwt sulphate of ammonia, 2 cwt superphosphate and 1 cwt muriate of potash per acre. In 1960, the dressings of fertilizer were equivalent to 3½ cwt sulphate of ammonia, 3½ cwt superphosphate and 2 cwt muriate of potash per acre. The areas of land set aside for zero grazing were 32 acres in 1959 and 34 in 1960.

In both years grass was cut twice each day by a 43-inch wide in-line flail-type forage harvester, to which was attached a self-emptying trailer so that only one medium-powered wheeled tractor was required. The self-emptying trailer was adapted from a farmyard manure spreader by removing the shredding mechanism and fitting high sides. This equipment worked perfectly except when ground conditions were very wet or very dry. In the latter case there was a lack of traction when travelling down even quite gentle slopes. Each load of grass was weighed and sampled for chemical analysis, and the quantity offered was judged to ensure some grass being left in the troughs when the next feed was due. The cows were, therefore, always fed grass to appetite and any anomalous result obtained would not be influenced by restriction of grass intake. So that the amount of grass consumed should be known the troughs were emptied before the fresh grass was put in, and the residue was weighed and sampled for chemical analysis.

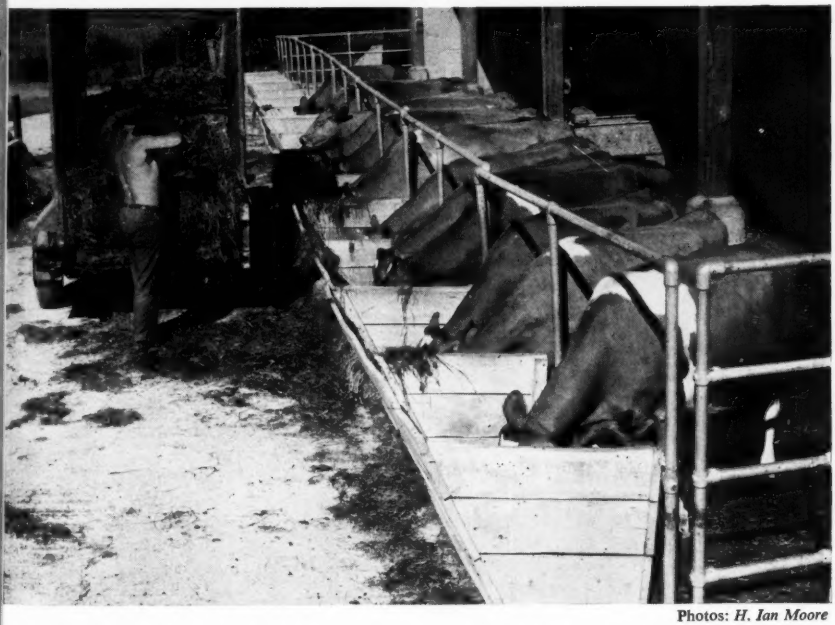
In 1959 zero grazing started on the 22nd April and ended on the 30th September. In 1960 it extended from the 27th April to the 29th September, inclusive. The cows used were drawn from the College herd of pedigree Guernseys. Twenty-three were used in 1959 and twenty-four (different animals) in 1960.

Grass production

In 1959 the rainfall was high enough in the early part of the zero grazing season to ensure a good growth of grass, but the rest of the season was very dry and grass recovery was slow. In 1960 growing conditions were satisfactory for a short period at the beginning of the season, but the early summer drought gave a very slow recovery after the early growth had been removed. After this, however, rainfall was sufficient, so that no difficulty was experienced in providing enough grass.

The quantities of straw used for bedding were 12½ and 16½ cwt per cow in 1959 and 1960 respectively.

The grass was cut twice daily with a flail-type forage harvester, which pulled a self-emptying trailer built from a farmyard manure spreader.



Photos: *H. Ian Moore*

Part of the 80 feet of trough space in the open-fronted shed which can house up to 30 cows.

Photo: *Transplanters (Robot) Ltd.*

Fineness of soil is important when planting potatoes: clods may allow pockets of fertilizer to touch the seed and scorch it.

Photo: *H. J. Hi*

Tines fixed to the frame of a plough to break up the furrow bottom and prevent the formation of a compacted layer.

Tulip Bulb Production (Article on pp. 18-20)

Texas Gold, a favourite Parrot Tulip.

Photos: *J. E. Downward*

The lily-flowered variety China Pink.

Photo: *J. H. Critchley*

Typical small farms near Chapel-en-le-frith. Farm circuit schemes have helped to spread information and advice in this part of North Derbyshire.

Farm Circuit Schemes (Article on pp. 23-6)

The figures in Table 1 show the output of grass dry matter obtained per acre during the zero grazing periods. The total annual output of dry matter per acre was greater, of course, because of the sheep grazing at the beginning and end of each season. The productivity of the two fields, judged on the basis of dry matter output, was approximately the same in both years. The area of grass required per cow was rather less in 1960 because of the lower intake of dry matter per cow (Table 2). The effective areas of grazing per cow, 0·8 and 0·7 acres, were less than the anticipated figure of 1 acre per cow for conventional grazing.

Table 1

	1959	*1960*
Dry matter output per acre (cwt)		
Silage	16·9	20·6
Hay	2·2	3·5
Zero grazing	26·1	21·7
Total	45·2	45·8
Effective area per cow for zero grazing* (acres)	0·8	0·7
Gross yield of milk, per acre used for zero grazing (gal)	341	542

*Calculated from

$$\frac{\text{Total area for zero grazing and conservation}}{\text{Number of cows}} \times \frac{\text{Wt. dry matter used for zero grazing}}{\text{Total dry matter produced in zero grazing period}}$$

Table 2

Average results	*1959* Grass only	*1960* Grass only	*1960* Grass and concentrate
Dry matter content of herbage fed (per cent)	24·7	17·7	
Daily weight of grass dry matter consumed per cow (lb)	24·8	22·2	
Daily consumption of water per cow (gal)	6·7	3·5	
Concentrates fed* per gal milk produced (lb)	—	—	1·44
Daily milk yield per cow in milk (lb)	23·8	25·1	29·6
Fat content of milk (per cent)	4·8	4·5	4·2
Solids-not-fat content of milk (per cent)	8·5	8·6	8·5
Weight of cows (lb)	1,059	944	950

*Except when steaming up.

Concentrate feeding

In the first year of the investigation grass alone was fed, to study the effects of such feeding on milk yields and cow weights. Milk yields were lower than expected for the cows employed, and the weight of the animals was approximately the same at the end as at the beginning of the period. In the second year, the 24 cows selected for zero grazing were divided at random into two groups at the start; one group received grass only but the other group received a limited amount of supplementary concentrate feed, of which

Typical small farms near Chapel-en-le-frith. Farm circuit schemes have helped to spread information and advice in this part of North Derbyshire. Photo: *J. H. Critchley*

88 per cent was cereal. Both groups received barley meal for the last six weeks before calving, the maximum daily ration being 6 lb per cow. The concentrate was fed at varying levels throughout the season; the average rate of feeding was 1·44 lb per gallon produced. This feeding of concentrates was associated with an increase in the average daily yield of 4·5 lb. There were no apparent differences in either body weight or condition between the two groups, which suggests that 7,086 lb concentrate produced an extra 10,881 lb milk—1·54 lb milk per 1 lb concentrate fed. The estimated Starch Equivalent of the concentrate feed was 70; this shows a response of 2·2 lb milk per 1 lb Starch Equivalent fed in the form of concentrate. The average price received for the milk produced in the College herd from May to September inclusive was 2*s.* 10*d.* per gallon. Thus the gross return for feeding 1 lb concentrate was 5*d.*; for the type of concentrates used in this investigation the cost per pound should not exceed 3*d.* The higher levels of milk production obtained with the concentrate-fed group was associated with lower fat and solids-not-fat contents.

Dry matter consumption

The lower dry matter intake in the second year could be due in part to the feeding of approximately 3 tons of concentrates during that year, but it is interesting to note that the weight of dry grass matter consumed per 100 lb body weight was 2·34 lb in both years. The relationship between dry matter content of the feed, dry matter consumption per cow and water consumption per cow is shown in the figure on p. 31. Both dry matter intake and the quantity of drinking water consumed increased with an increase in the percentage dry matter in the feed. The water trough in the zero grazing yard was fitted with a flow meter.

Labour requirement

A number of careful observations were made in both years to record the time spent in cutting and feeding grass. These also showed the times spent on the component tasks. The actual labour records would be of very little interest to a commercial farmer as, for experimental purposes, a number of non-commercial tasks were performed (such as weighing and sampling each load of grass). However, it has been possible to deduce the figures shown in Table 3, which shows the approximate time that would be taken if non-commercial tasks were eliminated.

Table 3

	Minutes
Travel from machinery shed to field	4
Hitch forage harvester	2
Cut grass	6–20
Unhitch forage harvester	1
Travel to zero grazing yard	2
Unload grass	16
Return to machinery shed	3
Total	34–48

The two tasks that may offer most opportunity for reducing the labour cost of zero grazing are the cutting and unloading of the grass. The time

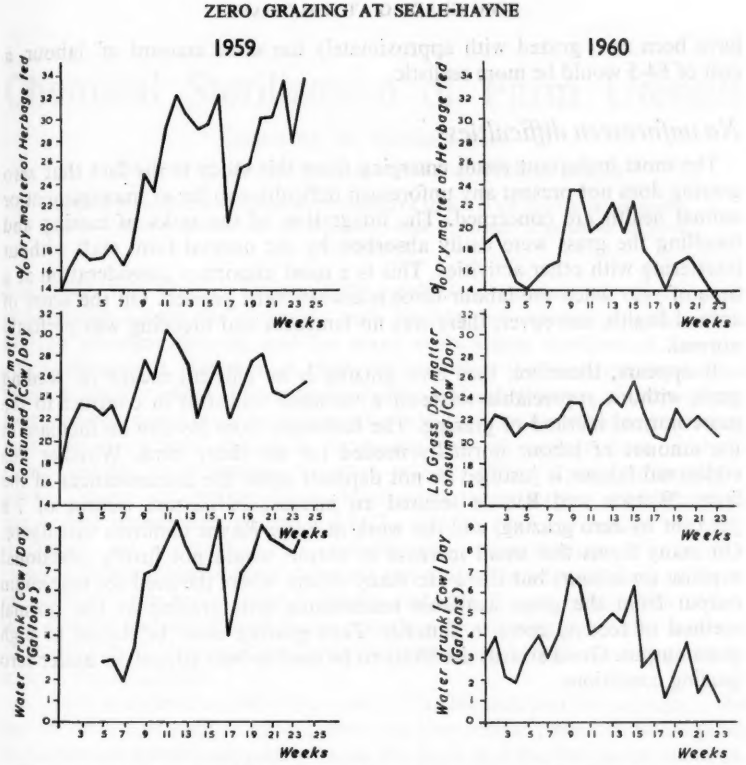


Figure showing the relationship between dry matter content of the feed, dry matter consumption per cow and water consumption per cow.

spent cutting grass is least when the crop is heavy and the field is large. The long time spent unloading grass was largely the result of using machinery which necessitated hand filling of the feed troughs. Abandoning feed troughs in favour of placing the cut grass on concrete, laid on the same level as the road used by the forage harvester, would also reduce the time spent unloading.

Apart from the time spent cutting and handling grass, zero grazing also demands extra labour for bedding yards and clearing the concrete in the feeding area. These two tasks required approximately an extra 50 minutes of manual labour per day. As the time spent cutting and handling the grass averaged 80 minutes a day, the total daily requirement would be 130 man-minutes. Against this must be set the time saved by not having to move an electric fence and not having to drive the cows to and from a field twice each day. Thus the net extra labour requirement of zero grazing was 90 man-minutes per day. Over a grazing season lasting 180 days the additional manual labour needed would be approximately 270 hours. If one hour of manual work costs 4*s.* 6*d.* and one hour of tractor labour 3*s.* 6*d.*, the extra cost in "labour" of zero grazing for 180 days would be £129. With the number of cattle used in the experiment at Seale-Hayne the extra cost per cow for "labour" would be £5 5*s.* As a rather greater number of cows could

have been zero grazed with approximately the same amount of labour, a cost of £4-5 would be more realistic.

No unforeseen difficulties

The most important result emerging from this study is the fact that zero grazing does not present any unforeseen difficulties so far as management or animal health are concerned. The integration of the tasks of cutting and handling the grass were easily absorbed by the normal farm staff without interfering with other activities. This is a most important consideration at a time of year when the labour force is always hard pressed. On the score of animal health, moreover, there was no lameness and breeding was perfectly normal.

It appears, therefore, that zero grazing is an efficient means of feeding grass without appreciable waste of a valuable foodstuff in contrast to the more normal method of grazing. The technique does involve an increase in the amount of labour normally needed for the dairy herd. Whether this additional labour is justified or not depends upon the circumstances of the farm. Watson and Runcie secured an increase in pasture output of 7·8 per cent by zero grazing, and the work at Seale-Hayne confirms this figure. On many farms this small increase in output would not justify additional expense on labour, but there are many others where the need for maximum output from the grass available necessitates zero grazing as the normal method of feeding cows in summer. Zero grazing must be linked to high grass output. Good swards are likely to be used to best advantage under zero grazing conditions.

★ NEXT MONTH ★

Some articles of outstanding interest

BULK COLLECTION AND DELIVERY OF MILK FROM FARMS *by J. C. Mauger*

PIDA *by G. R. Oake*

RECENT DEVELOPMENTS IN FARM BUSINESS ANALYSIS *by D. B. Wallace*

GROSS MARGINS AND FARM POLICY MAKING *by A. Gane*

HOW BIG ARE OUR BEEF BREEDS? *by I. L. Mason*

Chemical Sterilization of Farm Utensils

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Chemical sterilization is now used instead of steam in six dairies out of seven. Miss Cousins recalls its development and discusses alternative modern techniques.

THE Milk and Dairies Order (1926) prohibited the use of oxidizing or preservative agents for cleansing milk vessels and appliances other than milking machine clusters, and for many years steam sterilization was the approved method. However, in 1940 it became clear that war-time conditions might adversely affect the routine cleaning and sterilization of dairy plant. Furthermore, many more farms not always suitably equipped were producing milk and there was, therefore, increasing risk of wastage from souring. Consequently, to determine to what extent sodium hypochlorite might replace steam or boiling water, laboratory investigations and practical trials were undertaken at the N.I.R.D., and in 1942 the results were incorporated in a report.[1] The methods and concentrations of available chlorine then advocated have stood the test of time and are the basis of those officially recommended today.[2] Briefly, the utensils are rinsed with water, then cleaned and disinfected in one operation by washing in a warm solution containing both detergent and chemical sterilizer. A final rinse is given to remove the chemicals.

In 1943, as a direct result of the work of Dr. Mattick and his colleagues, the ban on the use of sodium hypochlorite was provisionally relaxed. Subsequent investigations carried out jointly by the N.I.R.D. and the Provincial Bacteriologists of N.A.A.S. on a large number of small farms in England and Wales[3] resulted in legislation in 1949, permitting the use of approved oxidizing or preservative agents as an *alternative* to steam or boiling water. (In Scotland, chemical sterilization is still not allowed except for bulk milk tanks, which cannot be steamed.) Until 1957 approval was given only to brands of sodium hypochlorite, and these had to conform to certain standards of chemical composition and stability to safeguard the user. This rather cautious approach to the recognition of chemical sterilization was necessary because of the time taken for its principles to be fully understood and translated into practice.

With steam sterilization the emphasis had always been, rightly, on the provision of enough steam to raise the utensils to the required temperature for sufficient time, and less attention was paid to methods of cleaning and the condition of equipment. In consequence, where chemical sterilization was introduced, results were often disappointing because users and their advisers did not always appreciate the impossibility of disinfecting rusty, cracked and pitted surfaces, frequently carrying hardened milk residues. Even the recommended concentration of disinfectant applied for the recommended time will fail under such conditions. However, as the use of hypochlorite gained in popularity its limitations became more widely known, and practical ways of overcoming them were introduced. For example, milking machine clusters

are more difficult to clean than other utensils; moreover, rubber surfaces deteriorate with normal use. Thus, wet storage of clusters and other ways of ensuring prolonged contact with cleansing solutions help to prevent a build-up of micro-organisms, and to preserve the rubber. Descaling with suitable acid solutions, where milk stone is apparent, and periodic treatment of equipment with solutions at bactericidal temperatures are necessary because chemical disinfectants lack the penetrative properties of heat.

Approval of combined detergent-sterilizers

The use of quaternary ammonium compounds (QACs) for disinfecting milk equipment was reported from America as early as 1942, and from 1949 onwards these compounds were tried out at Shinfield. They merited attention because they could be marketed ready mixed with detergents in powder form, so that only one easily-handled product was needed for washing-up instead of two. Also, QACs are stable for long periods and are non-corrosive. At first the products submitted for test were few, and in trials on local farms were clearly less effective than hypochlorite. As more and better products were submitted, the co-operation of the N.A.A.S. was again sought and, under the supervision of its officers, for three summers carefully controlled field trials were carried out on 30-40 farms each year. By 1957, manufacturers had been able to produce QAC-detergent mixtures which in the field trials and in laboratory tests gave results as good as hypochlorite used with an alkaline detergent, and so the first detergent-sterilizers were approved. The field trials showed that under farm conditions, properly instructed workers using bucket machine milking equipment which had been descaled and fitted with new rubbers were generally able to obtain satisfactory bacteriological results for at least 5 weeks with both hypochlorite and QACs. And this was accomplished without resort to special treatment of rubber components, descaling, or weekly treatment with steam or boiling water during the test periods.

Field trials are time-consuming and expensive, and since the Hoy Can Test—a performance test closely related to practical conditions—had predicted the results of the field trials,[4] it is now used to evaluate new products submitted for approval. They are tested in comparison with a standard detergent-hypochlorite solution for their ability to disinfect milk cans soiled with a heavily contaminated milk film. The colony count of the soiled cans varies between 10^8 and 10^9 per can, and treatment with hypochlorite-detergent solution (300 p.p.m. available chlorine, 0·25 per cent Na_2CO_3) at 110°F for 2 minutes usually reduces the count to less than 50,000 per can, a level regarded as evidence of satisfactory cleansing. Products comparing favourably with hypochlorite are normally recommended for approval and, clearly, they are very effective detergent-sterilizers. It is, perhaps, surprising that in practice it is often difficult to achieve consistently satisfactory results with chemical sterilization. However, the test cans before soiling are thoroughly clean, the surfaces are in very good condition and the milk film, unlike milk stone, is readily removed by an effective detergent.

Sodium hypochlorite is a simple chemical whose bactericidal properties have been studied for many years, and chemical analysis is adequate for its approval. In contrast, it is not yet possible to relate chemical composition of

detergent-sterilizers to their cleansing ability. Hence, at present a performance test is necessary.

Organic compounds which, in solution, release available chlorine have recently been developed and can be formulated as powders with suitable detergents. Products of this type have been subjected to the Can Test and, after use for short periods on farms to ensure that they had no ill effects on utensils and were acceptable to the workers, some have been approved.

Thus, for cleaning and sterilizing equipment the milk producer can choose from a variety of products, and his choice will be influenced largely by cost, since he has the assurance that all approved products, when used by accepted methods and at concentrations found effective on test, will give good results. If difficulties are experienced it is usually the producer's method or his equipment which is at fault.

New methods of cleaning and sterilizing

With any of the approved chemical agents, satisfactory cleaning using conventional methods requires skilled labour and time, thus adding to the costs of milk production. If cleaning is to be simplified, yet at the same time standards of cleanliness are to be maintained or improved, new methods of applying chemicals and improvements in plant design are required rather than new and better chemicals, since however good the disinfectant it will have little effect on micro-organisms protected by residues or in crevices.

Steam sterilization is regarded as too expensive by the producer, largely because of the cost of steam-raising equipment, although properly applied it is undoubtedly the most reliable method, particularly for complicated pipe-line plants. It may, in fact, be no more costly than an expensive chemical agent used extravagantly with a laborious cleaning routine. But steam is unpopular, and in a survey last year of more than 1,000 milk producers, only 14·7 per cent used steam or boiling water daily; the remainder relied on some form of chemical sterilization.

Two processes, immersion cleaning[5,6], in use on more than 2,000 farms, and circulation cleaning[6,7,8], which should still be regarded as experimental, are examples of developments to meet the need to save labour.

Immersion cleaning

This system makes use of the combined detergent and bactericidal properties of a strong caustic soda solution which, with a prolonged contact time at atmospheric temperature, is a remarkably effective disinfectant. It will also extract fat from rubber. In effect, immersion cleaning is an extension of the principle of wet storage, and was primarily designed for direct-to-can milking units. To withstand caustic soda solution the metal components must be of stainless steel. It is also suitable for cleaning clusters, long milk tubes and milking lids of bucket units; the buckets themselves and other bulky utensils are best cleaned by other means.

After milking, the units are rinsed thoroughly and the long milk tube and air tube disconnected. The liners are released from and retained clear of the shells by means of lugs on the milk stems, so that caustic soda and subsequent rinsing water can enter and drain freely. All the parts, including the milking

lids, are packed into a special perforated mild steel basket so that they are all accessible to the solution without risk of air locks, and the loaded basket, large enough to hold 3 units, is lowered into the immersion tank. This contains about 12 gallons 2-3 per cent NaOH solution, to which is added 2-6 oz ethylenediamine tetra-acetic acid (EDTA), depending on the hardness of the water, to prevent the deposition of calcium salts on the equipment. Just before the next milking the basket is taken from the tank, the equipment is drained, rinsed in weak hypochlorite solution (½ oz in 5 gallons water) and assembled ready for use. Preparing 2 units for milking, and afterwards putting them to soak, takes about 6 minutes. Once a month the caustic solution is renewed, the clusters are dismantled and the components brushed if necessary. The initial cost of the stainless steel components is high, but the system is cheap in labour and chemicals, and experience in practice suggests that it is more likely to give satisfactory results over long periods than conventional methods of chemical sterilization.

But direct-to-can milking has its limitations; for 2-level parlours and for bulk milk collection, pipe-line milking installations are the obvious choice and are likely to increase in many districts.

Circulation cleaning

The more complex types of pipe-line milking installations, with weigh jars and releasers, are not easy to clean, and for consistently satisfactory results frequent dismantling and steam sterilization have usually been considered essential. The introduction of circulation cleaning, which is a form of "in place" cleaning, seemed to be an attractive proposition. It usually involves a preliminary cold rinse, followed by circulation of detergent-sterilizer solution at a temperature of at least 90°F for not less than 10 minutes, using the vacuum pump or a positive pump to circulate the solution. A final rinse to remove detergent-sterilizer is given. Those items not included in the cleaning circuit, vacuum can lids, cooler, etc., are cleaned by hand.

To be successful a circulation cleaning system must effectively sterilize the plant. It should also save considerable time, and certainly be no more costly than conventional methods using steam. A recent assessment of circulation cleaning as practised on farms in England and Wales[7] shows that chemical agents alone have not succeeded in keeping pipe-line plant clean enough. Bacterial counts tended to be high and inconsistent, regardless of the type of installation and quantity and type of detergent used. However, where solutions or rinses were applied at temperatures above 130°F results were improved because of the bactericidal effect of heat. Experience with circulation cleaning at the N.I.R.D. has borne out these findings; although there has been no difficulty in keeping the plant visibly clean, certain components such as weigh jars and liner assemblies cannot be kept bacteriologically clean without frequent dismantling for manual brushing. This is because pipe-line plants do not consist of smooth unbroken surfaces. At present joints, usually with rubber as a component part, are essential and these, it seems, provide crevices in which milk solids and bacteria can accumulate. Improvements in design to reduce or eliminate joints may be beneficial, but the application of sufficient heat at suitable intervals to prevent a build-up of bacterial contamination will probably still be essential.[8]

There is no doubt that ways of applying lethal temperatures to the plant using the circulation cleaning system, without undue demands on the workers' time, will be found. This will probably involve the use of very hot water, since the equipment needed to produce it is cheaper than that for raising steam under pressure. Work to determine the most satisfactory combination of heat and chemicals, having due regard to costs and labour requirements, is already in progress at Shinfield, the criterion of success being satisfactory bacterial counts in every part of the plant.

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Attitudes to Incentive Schemes

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An analysis of the pros and cons of bonus schemes and piece rates as they recently appeared to farmers on Tweedside and in north-east Durham.

BONUSES are sometimes paid to stockmen and other specialists, and piece rates have long been associated with a few seasonally important manual jobs, but neither form of incentive payment has ever been very widely applied in agriculture. In view of this, and as a first step in an investigation which we are carrying out from Durham University, it was thought important to discover by postal questionnaire what farmers thought about bonuses and piece rates, together with their opinions of any schemes they may have tried.

Two farming areas in the north were chosen. The first, Tweedside, contains many large farms, and cash cropping is important. It was expected that here there would be more than average interest in incentive schemes, and perhaps rather more experience of applying them. The other region chosen was north-east Durham, a mixed farming area containing many small and medium sized farms.

The questionnaire was sent to each farmer on Tweedside with more than 50 acres, and to half of the farmers with over 50 acres in north-east Durham.

The exclusion from the investigation of those farmers with less than 50 acres was, of course, arbitrary. Not all farmers with more than this acreage necessarily employ sufficient hired labour to justify interest in bonuses and piece rates, and this was found to be an important reason for failing to reply.

Reasons for operating incentive schemes

Eleven farmers operating bonus schemes and twenty-three paying piece rates gave as their reasons for operating them:

Table 1

Reason stated	Bonuses		Piece rates	
	Tweed-side	*Durham*	*Tweed-side*	*Durham*
1. To encourage extra effort, time or interest	13	4		
2. For speed, timeliness and to meet labour peaks			10	5
3. To pay according to the work done and control labour costs			10	
4. To attract casual labour and regular workers outside normal hours			6	1
5. As a reward for exceptional efficiency or responsibility	7	1	4	

In all cases, therefore, bonuses are intended either to add to the value of output or to attract and keep labour. In this they would appear to be successful, for the farmers operating them believe that nineteen bonus schemes result in extra effort, time or interest being applied by their workers, that this is reflected in higher yields or a better quality product, and that in twelve instances their workers are more contented because schemes are operated. In only three instances is a reduction in costs among the advantages stated to be obtained.

In contrast, piece rates are paid more to encourage speed and timeliness, and to meet the need for additional labour at busy times of the year. Although the immediate reasons for applying piece rates therefore differ from those given for bonus schemes, their general objectives are very similar. Piece rates, like bonus schemes, are regarded firstly as a means of increasing the quality or quantity of output, secondly as a method of attracting or retaining labour, and only thirdly as a means of reducing labour costs. This is perhaps surprising, as both bonuses and piece rates would appear to offer many opportunities of reducing labour and other costs, and this is why they have been widely and successfully applied in other industries.

Why some schemes have been dropped

If the generally accepted view that incentive schemes cannot be satisfactorily applied in agriculture is correct, one would expect a considerable number of farmers to have tried them and found them unworkable or unprofitable. As is shown in Table 2 on p. 39, this does not appear to be the case.

Only three questionnaires were returned by farmers who had tried out bonus schemes and found them to be unsatisfactory. In one case, that of a milk yield bonus paid to a cowman, the farmer wrote that it had proved impossible to work out a scheme which was considered fair. In a second case, where a stockman was paid a fixed sum for each beast sold fat, payments

were stopped because the farmer thought that too much attention was being paid to fattening beasts and too little to store cattle. In the third case a stockman was given two and a half per cent of the profits obtained from winter cattle feeding, but payments lapsed because, after deducting income tax, the small amount of bonus earned seemed to cause dissatisfaction rather than act as an incentive. In at least two of these instances it appears that the stated objections could have been readily overcome.

Table 2

Major reasons for ceasing to operate incentive schemes

Major reason stated	Bonuses		Piece rates	
	Tweed-side	*Durham*	*Tweed-side*	*Durham*
1. Lack of suitable workers prepared to undertake piece work instead of overtime			7	2
2. Innovations have made piece rates unnecessary			2	5
3. Innovations made constant revision of rates necessary			1	
4. Poor quality work or abuse of scheme		2	2	3
5. Provided little or no incentive	1			

By contrast, fifteen farmers had discontinued piece rates. Only five, however, gave poor quality work as the major reason for reverting to ordinary time rates. Nine cited as a major reason lack of suitable workers prepared to undertake piece work, regular workers preferring overtime rates to the piece rates offered. On seven farms technical innovations, notably those associated with drilling, thinning, singling and harvesting roots, have so successfully reduced labour peaks that the farmers no longer feel the need for piece rates to cope with certain important seasonal jobs. In addition, one farmer, who had had a piece rate for ploughing, found it inconvenient to make repeated revisions to take account of constant changes in ploughing techniques.

Apart from these major reasons for ceasing to make incentive payments, farmers were asked if they were critical of the schemes tried out for any of the following reasons:

Table 3

Secondary reasons for ceasing to operate incentive schemes

Secondary reasons stated	Bonuses		Piece rates	
	Tweed side	*Durham*	*Tweed side*	*Durham*
1. Too much trouble				
2. Cause of poor quality work			8	7
3. Open to abuse		1	5	4
4. Unsatisfactory to workers	1	1	1	2
5. Unfair in any other way		2	1	2
6. Unprofitable			3	3

None thought bonuses to be either too much trouble or a cause of poor quality work. One thought them to be open to abuse, two to be unfair, and two to be unsatisfactory to their workers. None however, specifically thought them unprofitable.

Similarly, piece work was not considered to be too much trouble. In each case, however, the possibility of some unsatisfactory work was suggested as a secondary reason for ceasing to pay piece rates, and in nine instances piece

rates were considered open to abuse. A few farmers also thought them unsatisfactory to their workers, and unfair in other ways. Six were opposed to them because they thought them actually unprofitable. Of fourteen farmers, therefore, with first-hand experience of bonus schemes, only three considered them to be unsatisfactory. Similarly, of thirty-eight farmers with experience of piece rate payments, only five have found them to be unsatisfactory and have reverted to time rates, although ten more who have stopped using piece rates for other reasons agree that they have some disadvantages.

The majority continue to operate one or more incentive schemes, and are apparently satisfied that the advantages outweigh the disadvantages.

Why not adopt incentive schemes?

The views of twenty-one farmers replying to the questionnaire who had had no personal experience of either bonus schemes or piece rates are summarized in the Table below:

Table 4

Reasons for not operating incentive schemes

	Major reasons		Secondary reasons	
	Tweed-side	*Durham*	*Tweed-side*	*Durham*
1. Too much trouble			3	2
2. Cause of poor quality work without extra supervision	2	2	2	9
3. Open to abuse			2	6
4. Unsatisfactory to workers	2	1	1	2
5. Unfair in other ways	1	2	2	5
6. Unprofitable		2	2	5
7. A cause of jealousy between workers	1		1	
8. Unnecessary	2	10	3	
9. Would not enable a reduction in staff			1	
10. Mechanization preferred		1		

Many of the farmers with no first-hand experience of incentive schemes apparently think them unnecessary, ineffective or impracticable. Yet with few exceptions those farmers with experience of them have found them to be workable and advantageous.

It was not thought practicable to include questions about output and profit in the questionnaire, and it will not be possible to assess the extent to which different schemes influence profitability until later in the investigation.

As is shown below, the information available does suggest some connection between the use of incentives and labour costs, but whether this is due to the incentive effect of existing schemes or to the different attitudes to labour management held by those farmers who operate them is by no means certain:

	Regular workers per 100 acres	
	Tweedside	*Durham*
Labour-reducing schemes operated	1·2	1·9
No schemes operated	1·4	2·2
Labour-increasing schemes operated	1·7	2·9

Certainly those farmers offering incentives to more intensive labour use are achieving this successfully. Likewise, less than the average amounts of regular labour seem to be needed by the farmers in each area who operate incentive schemes to reduce labour requirements.

Short Guide to the Annual Review, 1961

The results of the 1961 Annual Review and Determination of Guarantees were published in a White Paper (Cmnd. 1311)* on 16th March.

Agricultural net output, which last year reached a record level of 68 per cent above pre-war, rose again, and this year is forecast to be 72 per cent above pre-war. On the new index of net output (1954/55 to 1956/57 = 100) introduced at the last Review, the forecast for 1960/61 is fractionally above the revised figure for last year of 114.

The tillage area at June 1960 was greater than in 1959, with a larger acreage under cereals, chiefly barley. Crops grew well in the first part of 1960, but the prolonged rains from early July severely hampered harvesting and subsequent operations. Although quality in general suffered, the production of most crops increased. The output of milk, beef and poultry has also been increasing, but there have been fewer pigs and eggs. More concentrated feedingstuffs have been used but, with the larger supplies of home-grown cereals, imports of feed are expected to be lower.

Despite the lamentable weather from July onwards, the industry's income is being maintained. The net income forecast for 1960/61 is £359 million, compared with the revised estimate for 1959/60 of £356 million. Adjusted for normal weather conditions, the forecast for 1960/61 is £373 million—the highest figure so far—against a revised figure of £355 million for 1959/60. (Details of farmers' net incomes are given in Table 2 on p. 42). The difficult conditions of the past autumn and winter may affect actual income in the coming year and, although it is accepted that the farmer must normally carry the risks of weather, the circumstances have been so exceptional that the Government have taken them into account in assessing the industry's prospects.

There has been a considerable net increase in the cost of goods and services used in agriculture, amounting to about £19 million for Review commodities, against £13 million last year. The efficiency of the industry also continues to increase, and this has been taken into account on the lines set out in the White Paper (Cmnd. 1249)† *Report on the talks between the Agricultural Departments and the Farmers' Unions* in December 1960.

The Government's main objectives this year have been:

1. To increase the production of beef, and to devise some modification of the pooling arrangements under the milk marketing schemes which will bring home to the producer the fact that beyond a certain point he gets only the manufacturing price for the milk he produces. The Unions have agreed to do their best to devise with the Boards a satisfactory system, and it is on this understanding that the guaranteed price has been increased. If it proves impossible to get such a scheme, this increase will have to be reconsidered at the next review.
2. To stimulate pig production and rid the industry of recurrent pig cycles.
3. To bring about a better balance between the guaranteed prices of the main cereals, and to improve the marketing of barley.
4. To improve potato growers' returns, and strengthen the market in years of heavy surplus.

The net effect of these and other changes is to increase the value of the guarantees by £14 million. In addition the Government will encourage co-operation among farmers by making grants towards the cost of buildings for machinery syndicates.

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*H.M. Stationery Office. Price 1*s.* 3*d.* (1*s.* 5*d.* by post).
†H.M. Stationery Office. Price 9*d.* (11*d.* by post).

Table 1

Estimated gross output of agriculture in the United Kingdom[1]
Years beginning 1st June

	£ million	
	1959/60	1960/61 forecast
TOTAL FARM CROPS[2]	265·1	258·2
Grain:		
Wheat	68·7	68·9
Barley	69·2	67·1
Oats	12·8	10·7
Other	0·4	0·5
Potatoes	66·7	61·4
Sugar beet	34·5	36·9
Hops	6·7	6·9
Other	6·1	5·8
TOTAL FRUIT, VEGETABLES AND FLOWERS	142·3	133·1
Fruit	41·9	37·5
Vegetables	78·8	73·4
Flowers and nursery stock	21·5	22·2
OTHER OUTPUT[5]	30·7	36·0
TOTAL LIVESTOCK AND LIVESTOCK PRODUCTS	1,028·8	1,053·8
Total fatstock	431·7	435·1
Cattle—beef	191·4	198·5
Calves—veal	4·6	5·2
Sheep and lambs—mutton and lamb	77·8	77·3
Pigs not for bacon—pork	102·0	103·8
Pigs for bacon—bacon pigmeat	55·9	50·3
Milk and milk products	343·4	349·3
Eggs[3]	157·0	162·2
Poultry[4]	77·0	88·9
Wool	17·3	15·8
Other	2·4	2·5
CHANGE IN STOCKS[6]	+29·0	+0·8
TOTAL	1,495·9	1,481·9

1. In Great Britain from holdings of over one acre only; in Northern Ireland one acre and over.
2. Includes sales of crops for feed.
3. For food and for hatching.
4. For food and for stock.
5. Includes deficiency payments for barley, oats and mixed corn not sold off farms.
6. Value at market prices of changes in the volume of stocks and work in progress.

NOTE. Because of rounding, sums of constituent items do not always coincide with totals as shown.

Table 2

Estimated farming net income in the United Kingdom
Years beginning 1st June

	£ million	
	1959/60	1960/61 forecast
FARMING NET INCOME	356	359
TOTAL EXPENDITURE	1,266·5	1,269
Labour	312·5	312·5
Rent and interest	93·5	105
Machinery:		
Depreciation[1]	82·5	81
Fuel and oil	47	44·5
Other	91·5	90
Feedingstuffs[2]	352	343
Fertilizers	118	115
Seeds[3]	30·5	31
Imported livestock[4]	49·5	53
Other expenses	89·5	94
TOTAL REVENUE[5]	1,622·5	1,628
Farm crops[5]	265	258
Fatstock	431·5	435
Milk and milk products	343·5	349·5
Eggs and poultry	234	251
Horticultural products	142·5	133
Other products	50·5	54·5
Production grants and other credits	113·5	121
Valuation change[6]	42	26

1. Estimated provision for machinery and vehicles, at replacement cost.
2. Gross value of bought feed whether home-grown or imported.
3. Imported seeds plus merchants' margins on home-grown seeds.
4. Imported livestock plus transporting and merchanting charges on inter-farm sales of home-bred livestock.
5. Estimates in Table 1 are here adjusted for changes in stocks awaiting sale. Includes receipts from sales of crops for feed.
6. Increase in value at cost of stocks and work in progress.

Guaranteed Prices

Table 3

LIVESTOCK AND LIVESTOCK PRODUCTS (*a*)

Commodity	(i) Guaranteed Prices 1960/61 determined after the Annual Review, 1960	(ii) Price change compared with the 1960 Annual Review Guarantee	(iii) Guaranteed Prices 1961/62 determined after the Annual Review, 1961
Fat cattle (per live cwt)	157*s.* 0*d.*	+ 10*s.* 0*d.*	167*s.* 0*d.*
Fat sheep and lambs (per lb estimated dressed carcass weight)	3*s.* 3*d.*	No change	3*s.* 3*d.*
Fat pigs (per score deadweight)	45*s.* 10*d.*(*b*) related to a feed price of 27*s.* 1*d.* per cwt. On the basis of the current feed price of 24*s.* 7*d.* per cwt this guaranteed price is equivalent to 43*s.* 4*d.*	+ 3*d.*	43*s.* 7*d.*(*c*) related to a feed price of 24*s.* 7*d.* per cwt.
Eggs—hen (per dozen)	3*s.* 11·15*d.*(*d*) related to a feed price of 26*s.* 5*d.* per cwt. On the basis of the current feed price of 23*s.* 5*d.* per cwt this guaranteed price is equivalent to 3*s.* 8·63*d.*	No change	3*s.* 8·63*d.*(*d*) related to a feed price of 23*s.* 5*d.* per cwt.
Eggs—duck (per dozen)	2*s.* 5·58*d.*(*d*) related to a feed price of 26*s.* 5*d.* per cwt. On the basis of the current feed price of 23*s.* 5*d.* per cwt this guaranteed price is equivalent to 2*s.* 3·06*d.*	No change	2*s.* 3·06*d.* (*d*) related to a feed price of 23*s.* 5*d.* per cwt.
Wool (per lb)	4*s.* 5½*d.*	No change	4*s.* 5½*d.*
Milk (average per gallon)	3*s.* 1·45*d.*	+ 0·80*d.*	3*s.* 2·25*d.*

CROPS (*a*)

Commodity	(i) Guaranteed Prices for 1960 harvest determined after the Annual Review, 1960	(ii) Price change compared with the 1960 Annual Review Guarantee	(iii) Guaranteed Prices for 1961 harvest determined after the Annual Review, 1961
Wheat (per cwt)	26*s.* 11*d.*	No change	26*s.* 11*d.*
Barley (per cwt)	28*s.* 9*d.*	− 1*s.* 2*d.*	27*s.* 7*d.*
Oats (per cwt)	27*s.* 2*d.*	+ 3*d.*	27*s.* 5*d.*
Rye (per cwt)	21*s.* 7*d.*	No change	21*s.* 7*d.*
Potatoes (per ton)	260*s.* 0*d.*	+ 5*s.* 0*d.*	265*s.* 0*d.*
Sugar beet (per ton, 16·5 per cent sugar content)	128*s.* 0*d.*	No change	128*s.* 0*d.*

NOTES ON PRICE TABLES

(*a*) The guaranteed prices for fat cattle, fat sheep and wheat are average prices subject to variation seasonally; the guarantee payments for fat cattle and some fat pigs are subject to variation according to quality; and the method of calculating fatstock guarantee payments involves an element of estimation. Because the marketings of fatstock and wheat cannot be

accurately forecast, producers' average returns under the guarantees for those products in any year may be a little more or less than the guaranteed prices.

(*b*) The guaranteed price for pigs for 1960/61 in Northern Ireland was subject to a reduction of 1*d*. per score to take account of certain expenditure incurred on pig progeny testing stations in that country. This reduction ceased from 13th February, 1961.

(*c*) The guaranteed price for pigs for 1961/62 is subject to a flexible guarantee arrangement described in Cmnd. 1311.

(*d*) The prices guaranteed to the British Egg Marketing Board for hen and duck eggs are subject to profit and loss sharing arrangements in accordance with the terms of a financial agreement between the Government and the Board. They include an allowance for the Board's administrative costs in operating the guarantee arrangements and marketing expenses (including packers' margins, packaging costs, transport and, in the case of hen eggs, certain trading losses).

THE MINISTRY'S PUBLICATIONS

Since the list published in the March 1961 number of AGRICULTURE (p. 640), the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops (addresses on p. 56) or through any bookseller at the price quoted.

BULLETINS

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Includes concise descriptions of thirty-four herbs—some well known, others seldom grown; it discusses their uses, methods of cultivation and harvesting. Particulars of prevention and control of dieases and pests are also given.

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Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 5d.)

ADVISORY LEAFLETS

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No. 107. Black Leg of Potatoes (Revised)
No. 176. Currant and Gooseberry Aphids (Revised)
No. 182. Spurrey (Revised)
No. 187. Woolly Aphid (Revised)
No. 298. Salmonella Infection in Poultry (Revised)
No. 307. Root Knot Eelworm in Glasshouses (Revised)
No. 357. Peas for Drying (Revised)
No. 367. British National Hive (Revised)
No. 416. Hygiene in Milk Production (Revised)
No. 430. The Production of Small Roasting Chicken (Broilers) (Revised)
No. 443. Potash for Farm Crops (Revised)
No. 484. Glasshouse Symphylids (New)

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UNNUMBERED LEAFLETS

Virus Diseases of Cauliflowers
Wipe Rabbits off the Map

Farming Cameo: Series 2

36. North-west Norfolk

G. G. BULMAN, B.Sc.

District Advisory Officer

NORTH-WEST Norfolk is probably best known as the home of those great agricultural improvers Coke and Townshend, whose influence on agriculture extended throughout Britain and overseas. Both the Holkham and Raynham estates still remain, and H.M. the Queen's estate at Sandringham is world famous. This is an area where large estates predominate, but not nowadays entirely to the exclusion of smaller landowners and owner occupiers. Much of the district is well stocked with game, which is sometimes not so favourably regarded by the tenant farmers as by the shooting landlords.

With its big fields, free-draining soils and sparse hedges, the area is particularly suited to large-scale arable farming. The best soils are well-bodied sandy loams, but with many acres containing a high coarse sand fraction and large numbers of flints. In other parts of the district the soils are shallower and include a great deal of chalk, which underlies the sand over almost the whole area at different depths. The major part of the district is of Glacial Drift origin, but the Greensand in the south west continues northwards in a narrow strip near the coast, and marks the division between the Glacial Drift inland and the alluvial marshes bordering the Wash. The silt land of these enclosed coastal marshes south from Snettisham has mainly comprehensive pumped drainage systems and is similar in nature and in its agriculture to the rich fens which it joins at King's Lynn. From Snettisham the coastal marshes become narrower, and continue along the north coast with but a single break where Hunstanton cliffs mark the end of the Greensand belt. This narrow fringe of marshes is less well drained, depending at best on gravity sluicing at low tide for outfall to the sea. Consequently arable cropping is rare and grass more usual, producing summer grazing of variable quality for cattle and sheep. This land is usually farmed as part of upland farms.

There are few small farmers, most of the land being worked in large units and groups of holdings. Appropriately, the Norfolk four course shift was formerly closely followed; indeed it still is in isolated cases. In its modified form as now practised an extra corn shift has usually been introduced and sugar beet has of course largely replaced the fodder roots. Sugar beet is a most important focal crop in the rotation. Many farmers retain a large root shift, with vegetable crops such as carrots, cabbages and Brussels sprouts being grown along with the permitted quota of sugar beet to complete the acreage.

If permanent grass is excluded, corn occupies well over half the total acreage. Barley is by far the most important corn crop, and until recently frequently commanded a handsome premium for malting. This has dwindled to a few shillings per quarter in recent years, due mainly to increased national supplies of barley. An appreciable acreage of wheat, and a few oats, complete the corn shift. New varieties and generous fertilizing have helped to increase

yields, but even with the best management the effect of a spring drought can be most marked on this light land.

The hay shift in the old four-course has been steadily reduced over the years. Alternative crops are most varied and include longer leys for seed or grazing, lucerne for drying, vining and harvest peas, and smaller acreages of poppies, mustard, rape and kale for seed. With the declining demand for fresh vegetables, the reduced market for harvested peas, and poor prospects for vining peas, the search for non-cereal crops with a sufficiently high return has become exceedingly difficult. A further increase in corn is not favoured because of the danger of foot rot diseases which can reduce yields to an uneconomic level.

Mechanization has been widely applied to many aspects of the farming in the area, but mechanical techniques with the sugar beet crop have been adopted only slowly. This is partly because the stony nature of the soil does not lend itself to mechanical thinning and harvesting, but mainly because most farms carry a large permanent labour force, or can obtain efficient casual workers, and can keep up a high standard of hand work. Although farmers know that savings could be achieved by increased mechanization accompanied by a reduction in regular labour, they are loath to stand off men for whom there is no alternative employment. It is on record that in the King's Lynn sugar factory area there is a lower proportion of beet harvested mechanically than in any other area in the country.

In contrast, the corn harvest has in many cases been completely mechanized. Some of the first combine harvesters in Britain were used in the Creake area, and from these early beginnings combining has spread to the extent that stooks of corn are a rare sight and bulk handling and storage of combined grain is becoming commonplace.

Livestock do not feature as prominently as cash cropping, and some farms are virtually stockless. Nevertheless, many cattle are fattened during the winter, usually in yards, with the by-products of arable crops providing a useful proportion of the food. The high price of stores in recent years has led to an increase in calf rearing, but many stores are still brought into the district, with Irish cattle forming an important source of supply. King's Lynn market is one of the largest fat cattle auctions in the country.

Dairy herds and ewe flocks are not numerous but, together with single-suckling beef herds, form an important means of using unploughable grass or leys, which are grown mainly for rotational purposes.

Irrigation systems have been installed on a few farms, but the more widespread adoption of irrigation is limited by the availability of water supplies. There are few rivers in the district and it is usually necessary to construct deep bores to obtain water. There is some doubt as to whether the heavy capital expenditure entailed will show a worthwhile return, and until this becomes clear further development is likely to be slow.

The farmers in this area adopt new techniques readily and soon absorb them into their normal farming practice. Changes in the farming pattern which may become economically necessary in the future are not likely to meet undue resistance here.

Your Fixed Equipment

The Questions Before Us

The first of a new series of twelve short articles which will be of interest to all farmers and landowners.

How important is the fixed equipment of British farms? Do we take it for granted? Do we get the best out of it? Indeed, what *is* "fixed equipment"? The ready answer is probably buildings, but fences, roads, drains, water supplies, electricity, and shelter-belts also come within the compass of fixed equipment.

In some farming systems, buildings can absorb up to half the labour effort on the farm, and in all cases the standard of accommodation and protection which they give to livestock, crops and implements must necessarily affect the efficiency of the farm.

Over the years we have steadily added to our buildings—and mainly piecemeal at that. Many are old and built for farming systems no longer acceptable. Such buildings can and do hinder progress to greater efficiency: damp, cold, and draughty, they take their toll of livestock; small, narrow, and badly sited, they waste time and labour.

There was never a more favourable time than the present for a critical appraisal of our homesteads. Never has there been a greater challenge. The new farming systems which have been introduced in the short span of twenty years, together with the great advances in our knowledge of the science of farming, and the promise of more to come, require that we should avoid hurried (and therefore perhaps unsound) decisions which can leave their mark for decades, or, at best, can only be corrected at great expense.

Owners and farmers will do well to make a critical examination of their buildings. How efficient are they? Are they fully utilized? Are they a hindrance to achieving lower costs? These are just a few of the questions that every landowner and farmer should ask himself.

Sometimes we seem to behave rather like magpies, and hoard our buildings when what we should be doing is to demolish them and start again. Is this because we always have a bare site available for a new building? There are many cases where a scrap-the-lot policy is the only one worth pursuing. By adding to our buildings, we can also add to our burdens of maintenance, depreciation, roads, transport of materials, and movement of labour.

We should pay close attention to the economics of our buildings. The availability of grants and tax reliefs should not deflect us from a very well-considered examination of proposals for new buildings or converting old ones. Conversions in particular offer scope for an appraisal of this kind. What will they cost, what shall we have at the end, will the conversion be as efficient as a new building, and what would a new building cost? These questions deserve full consideration and the answers careful deliberation.

Again, when we are considering new buildings we must ask ourselves whether the cost of employing the capital will be justified by greater profit

or by savings through lower costs of production. It is not enough that it would be nice to have a new building to show off to the neighbours.

Buildings are often condemned out of hand without a thought as to whether the routine carried on in them is the best possible. There is no justification for the common assumption that a new building is automatically more efficient than an old one. A building merely houses an operation; it is the *method* of operation which determines the degree of its usefulness. Although the application of work study techniques in the critical examination of buildings is quite new, it promises well and we are going to hear more of it.

New farming techniques have developed so rapidly that we must now look to our buildings to give us greater flexibility in use. Buildings of framed construction probably offer the best scope, since they give large covered areas which can be enclosed and fitted out in ways which allow still further changes to be made to meet future farming techniques. This adoption of the framed building is perhaps the first step along the road to still more fabrication—and this is almost certain to come in the country as it has in the town.

And what about fences? They cost money to maintain, and should be kept only when they are necessary to the most efficient use of the land. Hedges should, however, be abolished discreetly if we are to avoid spoiling the countryside. Where protection against the weather is needed shelter-belts can be planted, with advantage both to the farm and amenity.

Not as obvious as buildings but no less important are our roads. New and improved roads would improve mobility on many farms and avoid the frustration and ill-temper caused by struggling through axle-deep muddy tracks, to say nothing of the wear and tear (and sometimes damage) to vehicles and tractors. Even after the struggle is over the mud has to be removed from tractors, vehicles and implements, and this costs money.

Good roads well placed promote efficiency and reduce costs by providing quick, trouble-free access to the land whatever the weather. A road is not as imposing as a new building, but it is nevertheless just as necessary in present-day farming.

Obviously in so short a space much has to be left unsaid. If what has been said provokes deeper thinking about our fixed equipment problems, then the object of this introduction will have been realized.

C. ROBINSON

At the Farmers' Club

The NFU and the Industry

THE NFU was born as a result of the conditions imposed on agriculture by developments in the nineteenth century. Today, agriculture faces many complex and difficult problems. Is the NFU well constructed and geared for its task? At the Farmers' Club on 8th March, Mr. Harold Woolley, C.B.E., President of the NFU, answered this question with a firm yes. He described how the NFU is serving the industry in many fields—commercial development, credit, the Price Review, international representation, and many others—and is "the only body that can represent the economic and commercial as well as the political interests of farmers in this country".

The NFU's primary objective, said Mr. Woolley, must be to maintain a sound position politically. Its democratic organization has great strength. There are 59 county branches, 1,200 local ones and a total membership of some 200,000. The authority for the Union's policy rests in the Council, composed of elected delegates from every county branch plus representatives of horticulture and other specialized commodities such as poultry. There are 15 Standing Committees on commodities, and others to deal with legal, commercial and Parliamentary matters, education, transport, machinery, etc.

Mr. Woolley defined the Union's basic problem of organization as "combining to the greatest degree practicable the full and vigorous working of a nation-wide democratic body with prompt and business-like action at the top". Office holders must merit sufficient confidence to be given authority to act according to the demand of any situation—a point well understood by most members, and developed greatly during the "long and illustrious leadership" of James Turner, now Lord Netherthorpe.

The most publicized of the Union's activities—the Annual Price Review—is both complicated and arduous, he said, but the fact that each year the Government is required by statute to survey the farming industry's economic position and prospects is an invaluable safeguard. This is well appreciated, he added, by those of us who were in farming before the war. A formidable amount of work is required from both sides, and in paying tribute generally to the officials of the NFU, Mr. Woolley mentioned in particular the Economic Department as a very important instrument for the farming industry.

Reviewing the Union's present and future tasks, Mr. Woolley said that the essential thing on the home front was to ensure the fullest and most effective understanding with the Government. Beyond that, he said, "we have the responsibility for stimulating progress on sound lines on many production problems . . . We must press forward on problems of animal health. Much more support is needed for the Animal Health Trust. Through fuller education and training we must encourage a higher level of knowledge and skill among farmers and workers".

In the commercial field the NFU is not designed to operate directly, but there can be no question about its function in generating action and then maintaining effective contact and mutual understanding with any commercial

organizations that come into being, whether they are statutory marketing boards, or competitive commercial bodies. "On our side we must recognize the need for our commercial bodies to be free from petty interference in their business decisions. It is equally essential that the commercial entities continue to recognize that the NFU, on behalf of the whole industry, has a responsibility for effects which may flow from policies pursued by any individual commercial body."

Marketing methods are one of the NFU's major concerns. Mr. Woolley emphasized that creative thinking and energy will be required from all sources to provide expert and considered information and advice to groups of people who are reaching out into co-operative marketing.

Another current concern is the cost and quality of purchased requirements. "It has been suggested that the organization of the NFU is not sufficiently flexible or adaptable to take advantage of producers' desires to help themselves." But Mr. Woolley's view was that the ability of our farmers and growers to benefit from modern developments in production, processing and marketing depends essentially on their collective strength. "The NFU is the only body . . . capable of harnessing the energies of individual producers towards constructive development in the commercial marketing spheres."

"I believe", he said, "that the future lies in the provision of co-operative facilities rather than in large-scale amalgamation." Machinery syndicates are an example of what can be done. By vetting individual schemes for soundness, the Agricultural Credit Corporation reassures the bank manager and protects the farmer from incurring heavy debts on projects of no commercial value. In its first full year, the Corporation supported loans amounting to over £2 million.

Mr. Woolley remarked that our livelihood is likely to be increasingly affected by trends overseas. In the international sphere the NFU sees that the position of the British farmer is understood and taken into account. The Bacon Consultative Council, which has proved useful in negotiating with countries supplying bacon to the British market, could be the prototype for securing more effective co-ordination between home and overseas suppliers of other commodities. We must increasingly investigate the possibility of such arrangements, he said—without of course departing from the firm principle of first place in the home market for the home producer.

SYLVIA LAVERTON

The speaker at the Farmers' Club on 10th May will be the Minister of Agriculture, Fisheries and Food, the Rt. Hon. Christopher Soames, C.B.E., M.P.

In Brief

ANIMAL HEALTH IN GREAT BRITAIN IN 1959

The comprehensive Report on the Animal Health Services in Great Britain* for 1959 shows that, so far as outbreaks of notifiable disease were concerned, the year was overshadowed by the worst epidemic of fowl pest ever known in this country. The 2,062 outbreaks resulted in the slaughter of nearly five million birds and the destruction of close on one million hatching eggs. The foot-and-mouth disease position improved, however, and the number of outbreaks was the lowest since 1955. Scotland and Wales became Attested Areas in 1959, and in Great Britain as a whole 95 per cent of all cattle had reached attested status. Since the Report was prepared, the whole of Britain has been declared fully attested.

The Report explains the methods used to restrict the introduction and spread of animal disease in Great Britain. It gives the results of experiments undertaken by the laboratories and on farms to diagnose, control and eradicate animal disease. Information is also given about exports of livestock and various products, and the protection afforded to animals during transit.

1960 RETURN OF ANIMAL DISEASES

In 1960 the incidence of bovine tuberculosis was reduced to a degree at which it ceased to be a national problem, but the year was the worst for outbreaks of foot-and-mouth disease since 1952. Outbreaks of fowl pest also increased; anthrax and swine fever decreased slightly.

This information, and a summary of the incidence of animal diseases and related matters for 1960, is given in the Statutory Return of Proceedings under the Diseases of Animals Act 1950†. A full report, including the work of the Laboratory Research and Investigations Services, will be published later.

RESEARCH INTO PEA GROWING

Pea growers will find much of interest in the 1959 Annual Report of the Pea Growing Research Organisation, which has recently been published.

Experimental work is reported on weed control, varietal susceptibility to downy mildew, pea root eelworm, evaluation of new vining varieties, seed dressings, varietal susceptibility to *Verticillium* wilt, plant nutrients, desiccation and the prevention of shedding. The summary of results is necessarily intended to be treated with reserve.

Promising pre-sowing and pre-emergence treatments for controlling wild oat and broad-leaved weeds have been obtained. Many herbicides were tried, but none of the post-emergence treatments approached the effectiveness of dinoseb (amine) and no other chemical proved as effective against wild oat as the recommended treatment of 3 lb propham (wettable powder) per acre.

Varietal susceptibility of peas to downy mildew is a very real problem, particularly in the Fens, and 28 different varieties were tested at three fenland centres. Although reaction to the disease varied somewhat between sites, the general picture was that Lincoln Small Blue, Dark Skin Perfection and Perfected Freezer could be classed as only very slightly susceptible. At the other end of the scale Zelka proved to be very susceptible; the remaining varieties came between these two extremes.

Studies were continued on the appraisal of new strains to extend the processing season. The most promising of the varieties tested in 1958 were tried again, and all

*H.M.S.O. Price 6*s.* (by post 6*s.* 6*d.*)
†H.M.S.O. Price 6*d.* (by post 8*d.*)

were harvested as nearly as possible to a tenderometer reading of 120. The full results of the tests have been presented in Technical Memorandum No. 4.

The comparison of row widths and seed spacings for vining peas with differing habits of growth was repeated. Varieties representing distinct types were tested at row widths of 8 and 16 inches, in all combinations with intra-row spacings of 1, 2 and 3 inches. In general, all varieties reacted similarly, except that larger differences occurred in basal branching, which increased with wider rows, and in yield, in which narrow rows consistently yielded better.

The Report is free to all growers and processors who contribute to the P.G.R.O. research levy scheme, and to associate subscribers. Non-subscribers may also obtain copies from the Pea Growing Research Organisation, Yaxley, Peterborough, price 1*s.* 6*d.* post free.

K. V. Cramp

ANDRÉ MAYER FAO FELLOWSHIPS, 1961

The Food and Agriculture Organization announce the offer of 10 or 12 André Mayer Fellowships in 1961. They will be for:

Research. For unusually promising persons with research experience behind them who would offer a guarantee for the carrying out of independent research work.

Research Training. For younger and promising individuals who have shown an inclination towards, and an aptitude for, research work. A proportion of the awards will be given to candidates from countries where research facilities are not highly developed and the need for trained research workers is great.

The subjects presented must relate to FAO's activities, which comprise: land and water development, plant production and protection, animal production and health, rural institutions and services, fisheries, forestry and forest products, nutrition (non-medical), atomic energy in food and agriculture, agricultural economics (commodities, statistics, and economic analysis).

Not more than two applications may be submitted by each Member Government of FAO, and Her Majesty's Government can sponsor only candidates of United Kingdom nationality.

Further information can be obtained from the Secretariat of the FAO National Committee for the United Kingdom, Ministry of Agriculture, Whitehall Place (East Block), London S.W.1.

The Secretariat should receive completed application forms by 30th April 1961.

SUPPORT FOR THE ANIMAL HEALTH TRUST

Veterinary Science and the Farmer is the title of a new dramatized documentary film in colour which shows something of the excellent work the Animal Health Trust is doing for the livestock breeder and farmer. It is hoped by this means to create among farmers an atmosphere of confidence in, and support for, the Trust and its work.

The loss caused by animal disease is estimated at £150 million a year, says Mr. Harold Woolley, President of the N.F.U., in an introduction to the film, and he emphasizes the need for financial support of the Trust "as a most valuable and necessary adjunct to the work being done by the Ministry".

This 16mm film (running time 25 minutes) can be recommended unreservedly for showing at evening meetings for its intrinsic value alone. It can be borrowed free from The Animal Health Trust, 14 Ashley Place, Westminster, London, S.W.1.

Agricultural Chemicals Approval Scheme

Additions to the 1961 List of Approved Products

THE following further additional products have been approved under the Agricultural Chemicals Approval Scheme since the first list of Approved Products was published on the 1st February 1961.

INSECTICIDES

DDT/GAMMA BHC (LINDANE) WETTABLE POWDERS

"Gammalin" Plus D.P.—Plant Protection Ltd.

FLUOROACETAMIDE SPRAYS

Vitax-F15—Vitax Ltd.

"KELTHANE" ATOMIZING SOLUTIONS

Aerocide Kelthane—Pan Britannica Industries Ltd.

"RHOTHANE" WETTABLE POWDERS

Rhothane Wettable—The Murphy Chemical Co. Ltd.

FUNGICIDES

DINOCAP ("KARATHANE") WETTABLE POWDERS

Karathane Wettable—Pan Britannica Industries Ltd.

ORGANO-MERCURY-SULPHUR FOLIAGE SPRAYS

Bugges Sulpham—Bugge's Insecticides Ltd.

ZINEB WETTABLE POWDERS

Bugges Dyblite Wettable Powder—Bugge's Insecticides Ltd.

Tiezene Blue Proforma Ltd.

HERBICIDES

CHLORPROPHAM (CIPC) SPRAYS

Triherbide CIPC—F. Bos Ltd.

2,4-DICHLOROPHENOXYBUTRYIC Acid (2,4-DB) ALKALI METAL SALT SPRAYS

Marks 2,4-DB—A. H. Marks & Co. Ltd.

MCPA ALKALI METAL SALT SPRAYS

"Eureka" MCPA Selective Weedkiller—Plant Protection Ltd.

2,4,5-T—2,4-D ESTER SPRAYS

Spontox
Sylvitox } —May & Baker Ltd.

MISCELLANEOUS

DICHLORPROPANE/DICHLORPROPENE MIXTURES

Shell D-D Soil Fumigant—Shell Chemical Co. Ltd.

Caution

Dressings containing dieldrin, aldrin and heptachlor can kill birds that eat treated seed. Great care should be taken not to leave any treated seed lying about when it is being stored or sown. Higher-strength dressings for wheat bulb fly should be used only on winter wheat, and then only in areas where there is a real danger of attack.

Book Reviews

The English Yeoman in the Tudor and Early Stuart Age. MILDRED CAMPBELL. Merlin Press. 42*s*.

The yeoman occupied a prominent place in English rural society in the sixteenth and seventeenth centuries. As substantial farmers they made a vital contribution to the ownership and exploitation of the land, while as men of moderate means and some education they were widely pressed into the service of local government. For these reasons the yeomen are sometimes referred to as the backbone of their England. The term "yeomen" may have had no precise legal definition but it was widely used and highly esteemed. It was applied to a varied and constantly changing group of men. Successful small farmers often rose to the ranks of the yeomen, and yeomen as often joined the ranks of the gentry. Miss Campbell has drawn on a wide range of printed and manuscript sources to give an eminently readable account of this wide "middle class" of society.

The yeoman was above all a farmer, and agricultural matters claim a large share of the author's attention. In a period of rapidly rising prices, expanding markets for food, and growing demand for land, there was ample opportunity of betterment for the enterprising and fortunate man. The yeomen, who owned or directly controlled their land, were better able to benefit than husbandmen who worked at their landlord's bidding. We are shown how the yeomen bought and leased additional land in order to increase their farms and their profits. Of special interest is the analysis of the size of their purchases, the length of their leases, and the amount of their rents. The yeomen were active, too, in consolidating their holdings and in enclosing them for improved methods of farming. Miss Campbell describes many aspects of their husbandry.

Other chapters deal with the yeoman's house and household, his schooling and advancement, church-going and entertainment. Finally there is a detailed account of his place in local government as parish constable, overseer of the poor, or in many another arduous office.

Miss Campbell's book was first published in 1942 and its reprinting is welcome. If this admirable overall picture of the English yeoman is inclined to generalize on so diverse a subject, the interested reader can now go on to such regional studies as Dr. Hoskins's of the yeomen in Leicestershire.

K.J.A.

Farm Machinery. (6th Edition.) C. CULPIN. Crosby Lockwood. 35*s*.

Twenty years ago, when many of us ploughed for the first time with a tractor, we entered a new era of farming progress, and had to master a new technique so different from handling a team of horses. As we read through the latest edition of *Farm Machinery* we become conscious that the farm machinery and tractors of the 1960s represent almost as great an advance on those of 1940 as 1940's did on the horse. Clearly and concisely, the author deals with a very wide range of farm machinery, and includes some of the latest mechanical aids to agricultural production; but he is not in too great a hurry to omit machinery such as binders and threshers which, while not being so widely used, have not been completely discarded.

This book contains valuable information not only for readers who really understand mechanical matters but for those who simply wish to ensure that they use and maintain their equipment in the best possible way.

The chapter on the setting and operation of ploughs could well be read by many whose tractor ploughing is not quite as good as it should be; many of us suffer from the desire to keep ploughing irrespective of whether our furrows are matching or the draught is correct. The appendix, too, on friction, lubrication and bearings, provides the type of reading which could easily save many pounds, as here again many tractor drivers keep driving whether the grease gun has been properly used or not.

This is certainly a book which offers value for money, and its author already has a national claim to respect for the experience which he so successfully puts on paper for the benefit of so many. It could do much to avoid not only the cost of repairs, but also the added cost of wasted time caused by breakdown.

G.J.

English Place Names. KENNETH CAMERON. Batsford. 30*s*.

To all who are interested in the history of the countryside, this book offers a valuable guide to an extremely intricate branch of topographical studies. The many invasions of England have left their mark upon the major and minor place names. The precise nature of this effect, and the translation of the meaning of a place name are not easy to decipher. Dr. Cameron gives many examples of these difficulties, including the meaning of Borstal, Kent. This might appear to mean "boar's stall", but the real meaning is "a place of refuge". In all cases one has to go back to the earliest spellings. A guide is provided to such sources, and a selection of manuscripts and old maps giving this evidence is provided in the illustrations.

The book is distinguished from many similar works by its greater coverage of minor place names. There is the usual discussion of the sources of different parts or elements of place names associated with Celtic, early English, Scandinavian and Norman-French influences, but much else besides. Recent work on Celtic names is brought to the notice of the general reader in an easily assimilated form, and suggestions that some undecipherable elements might even be pre-Celtic in origin give one a glimpse of the frontiers of knowledge in this field. The relationship between place-names and archaeology, with pagan and Christian associations and social customs is also discussed. There is a series of chapters dealing with the origin of the main types of place name, including those of settlements, main roads, counties, rivers, hills, valleys, woodlands, streets and fields. All of these chapters are illustrated by a wealth of examples. This practice, at first, tends to break the flow of the narrative, but as one becomes used to it, the conclusions of the author and his co-workers become more readily acceptable. A 24-page index provides a useful key to the many interpretations given in the text, and an appendix of the commoner place—name elements enables one to guess at explaining place names encountered in the field. For a more scholarly approach, there is a guide to the more important books and articles on the subject.

One minor note of criticism of this otherwise excellent book is the absence of a concluding chapter. One would like to see many of the threads drawn together and some indication given of the way in which this work can be used by the historian and historical geographer. Hints of this are given in the introductory chapters, but before the reader has been fully introduced to the subject. The book is by no means light reading; it is aimed at the intelligent layman, but would also serve as an introduction to the subject by students of English. For those interested in the meaning of country names it should become a valuable guide and friend. The typography and general production of the book are also to be highly commended, the text being singularly free from errors.

G.T.W.

Feeding Pigs. I. A. M. LUCAS. Pig Industry Development Authority. 1*s*.

The subject of the first advisory booklet published by PIDA is the feeding of pigs. They entrusted the task of preparation to Mr. Lucas of the Rowett Research Institute, and a better choice could not have been made.

In the foreword Mr. Lucas stresses the need to avoid generalizations, and states that success in feeding pigs comes from the intelligent application of existing knowledge to the conditions and circumstances in any pig enterprise. Our knowledge on feeding is far from complete, but the practical advice contained in this booklet will certainly be helpful to many.

Mr. Lucas points out the great variation in the composition of individual feeding-stuffs, which may considerably affect their nutritive value. In discussing the effect of cereals on carcass quality, it would perhaps have been better to explain that differences

in energy and fibre content are the factors mainly responsible for variation in carcass quality when different cereals are fed. When considering high protein feeds, Mr. Lucas rightly, but for a wrong reason, does not recommend cottonseed meal. If the limiting factor was the toxicity of gossypol, this could be overcome by removal of the gossypol by modern processing methods. However, even gossypol-free cottonseed meal has only a limited value for pigs.

When discussing methods of feeding, the advantages of restricted feeding are stressed, although it is pointed out that some (in my view, very few) strains are well suited to *ad lib.* feeding. Food restriction by lowering the quantity of meal offered or by mechanical means is also mentioned. One could add that the control of flow of meal in self-feeders need not necessarily be limited to "pulling a handle". For example, many American self-feeders are constructed so that a little meal comes down at a time, thus limiting the amount consumed daily. One wonders what evidence there is to support the statement that it is better to add a little water to the meal and allow access to water bowls, than to feed wet with a specified amount of water added to the meal and no other water available.

When discussing dead weights of pigs, Mr. Lucas states that killing out percentage is about 75 at 200 lb and about 80 at 260 lb live weight. Perhaps he quotes some recent statements from commercial sources. Independent evidence suggests that the difference is considerably less than 5 per cent.

The N.I.R.D. recommendation on formalin treatment of skim milk is incorrectly given—it should be 1 and not 1½ gallons of formalin per 1000 gallons of skim milk, except during very hot weather when up to 2 gallons may be essential to prevent souring. In recommended treatments for anaemia there are several points of a rather controversial nature, and certainly iron dextran is not the only preparation available for intramuscular administration. I was a little surprised to see an unqualified recommendation for feeding unsupplemented cow's milk to orphan pigs 2-3 days old. The recommendations for feeding breeding stock are likely to give reasonable results in practice, but Mr. Lucas admits quite freely that they are mainly empirical and have very little scientific evidence to support them.

These few comments are intended as constructive criticism and not meant to detract from the very considerable value of the booklet. It is well written, well presented, and very cheap at the price of one shilling.

R.B.

Books Received

Some Statistics of Poultry and Eggs in Britain 1960-61. K. E. Hunt and K.R. Clark. University of Oxford Institute for Research in Agricultural Economics. 7*s.* 6*d.*

The Grass Crop its Development Use and Maintenance. William Davies. (Revised 2nd Edition). Spon Ltd., *45s.*

The Thatchers Craft. Rural Industries Bureau. *42s.*

AGRICULTURE

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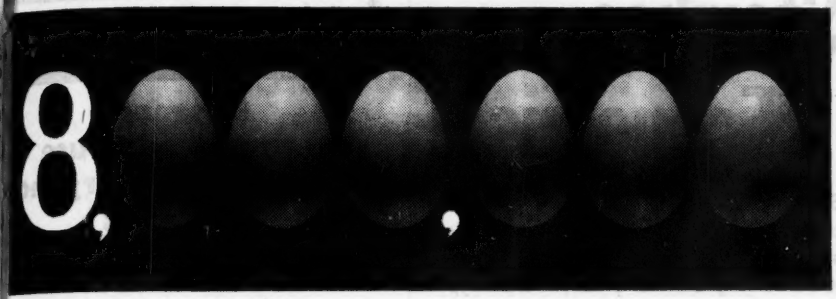

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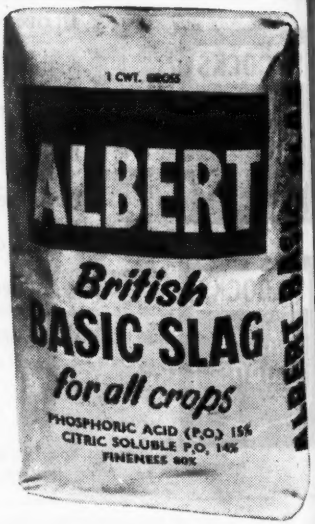

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